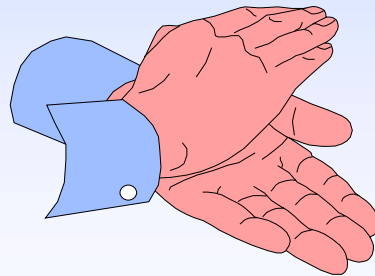


WELCOME

**ATC 2070 & ITS CABINET WORKSHOP
SPONSORED BY CALTRANS**



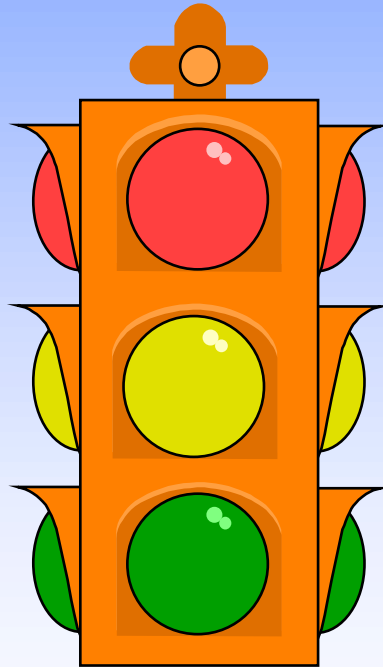
2070 & ITS CABINET WORKSHOP - AUGUST 2001

ATC 2070 WORKSHOP

**MARTHA STYER - OFFICE CHIEF,
ITS DEVELOPMENT AND SUPPORT
TRAFFIC OPERATIONS
CALTRANS H.Q., SACRAMENTO**



CALTRANS' ROLE ATC - ITS WORLD



■

- **WHERE WE ARE NOW**
 - ITS STATUS
 - ACCOUNTABILITY
- **WHERE WE ARE GOING**
 - CALTRANS “GRAND” MASTER PLAN
 - USE OF CONSULTANTS
 - PROJECT MANAGER ROLE
 - GENERAL BLUEPRINT



WORKSHOP AGENDA

INTRODUCTION

ATC MODEL 2070 CONTROLLER UNIT

MODEL 2070 APPLICATION PROGRAMS

ITS CABINET FAMILY

TRAINING ASSESSMENT

FLOYD WORKMON



SESSION 1 - MODEL 2070

**ADVANCED TRANSPORTATION CONTROLLER UNIT
AS SPECIFIED IN CHAPTERS 9 & 10 OF TEES 11/19/99
DOCUMENT AND CURRENT ERRATA.**

- **THE ATC UNIT IS MODULAR, INTER-CHANGEABLE MODULES, MULTI-APPLICATION.**
- **IT WAS DEVELOPED TO JOIN THE 170 CONTROLLER FAMILY. IT INTERFACES WITH NEMA TS 1&2 AND 170 CABINET FAMILIES. IN ADDITION, IT IS A MATED PAIR TO THE NEW ITS CABINET FAMILY**
- **THERE HAS BEEN OVER 26 APPLICATIONS IDENTIFIED FOR THE ATC.**



5 VERSIONS

- **2070 V (VME) UNIT - 170 & TS 2 CABINET**
- **2070 L (LITE) UNIT - 170 & TS 2 CABINET**
- **2070 LC (LITE) UNIT - ITS CABINET**
- **2070 VN (VME & NEMA) – TS 1 CABINET**
- **2070 LN UNIT (LITE & NEMA) – TS 1 CABINET**

2070 V UNIT

- **2070 CHASSIS**
- **CENTRAL PROCESSING UNIT 1A - DUAL BOARD MODULE WITH VME MASTER / SLAVE CAPABILITY**
- **FIELD I/O MODULE 2A OR 2B**
- **FRONT PANEL 3A**
- **POWER SUPPLY 4A**
- **VME CAGE ASSEMBLY 5**

2070 LITE UNIT

- **CHASSIS**
- **CENTRAL PROCESSING UNIT 1B - SINGLE BOARD WITH ETHERNET & SERIAL PORT 8**
- **FIELD I/O MODULE 2A OR 2B**
- **FRONT PANEL 3B**
- **POWER SUPPLY 4A OR 4B**

2070 LC UNIT

- **CHASSIS**
- **CENTRAL PROCESSING UNIT 1B**
- **FIELD I/O MODULE 2B OR NONE ***
- **FRONT PANEL 3B OR 3C**
- **POWER SUPPLY 4A OR 4B**

OTHER MODULES

- **BEE BOX**
- **CENTRAL PROCESSING UNIT 1C (FUTURE API)**
- **6A TWO MODEMS AND/OR 1200 BPS EIA
232 SERIAL PORT**
- **6B TWO MODEMS AND/OR UP TO 9600 BPS EIA
232 SERIAL PORT**
- **6D FIBER OPTIC COMM**
- **7A TWO COMM CHANNELS - EIA/TIA 232**
- **7B TWO COMM CHANNELS - EIA/TIA 485**
- **8 NEMA MODULE FOR TS 1 INTERFACE**



COST

2070 V (VME) UNIT = \$2,800 - \$3,200

2070 L (LITE) UNIT = \$2,000 - \$2,200

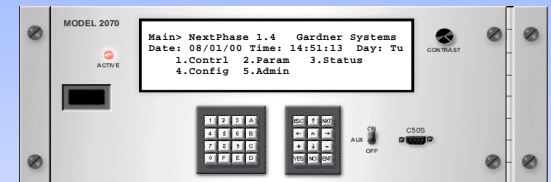
2070 LC (LITE/COMM) UNIT = \$1,300 - \$1,600

2070-8 (NEMA) MODULE = \$600 - \$800



SESSION 1.2

2070 OPERATING SYSTEM



CRAIG GARDNER

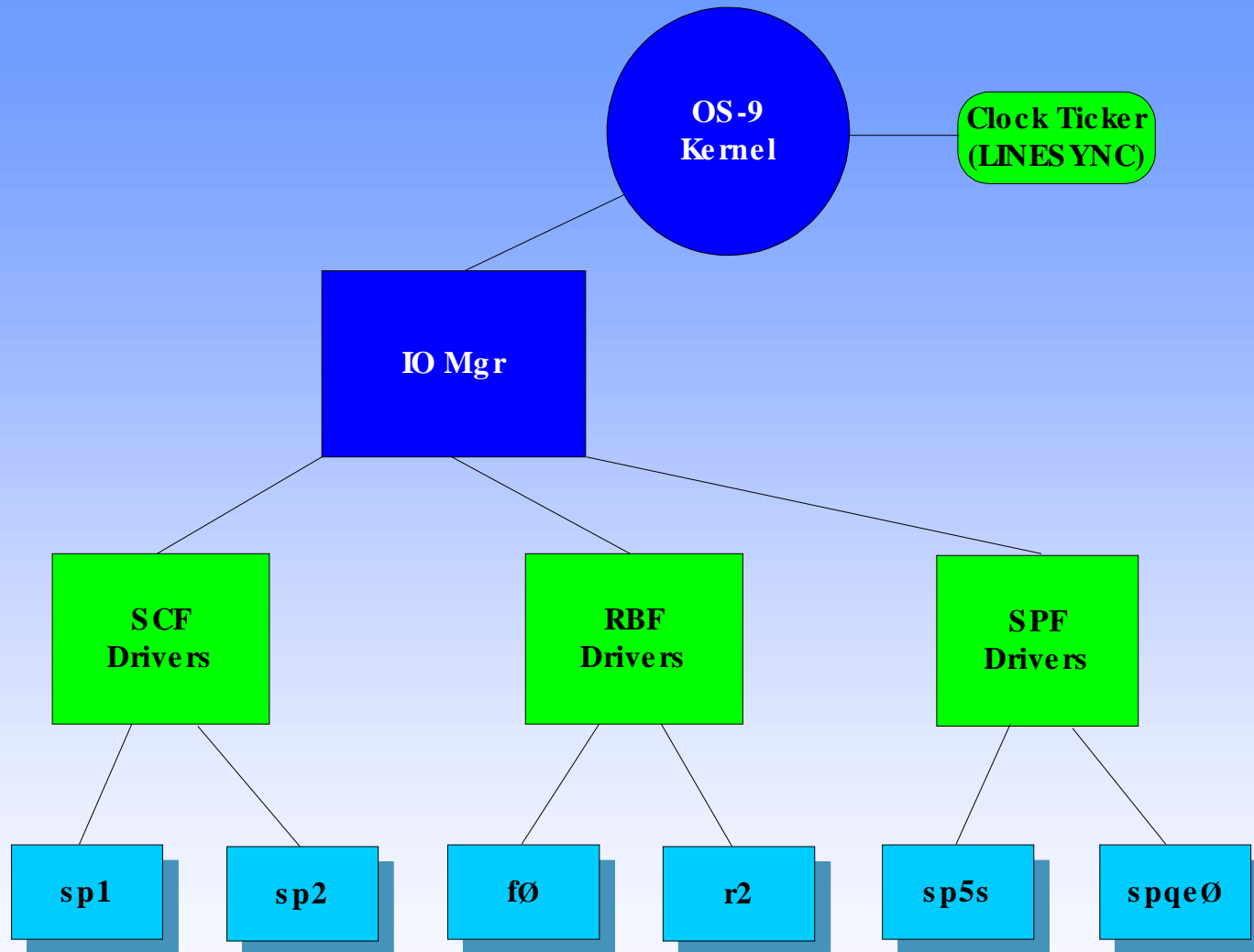
OPERATING SYSTEM

- **OS-9 RTOS by Microware**
- **Device driver API layer**
 - **Allows applications portability to any 2070**
 - **Simplifies access to controller features**
 - **Support for ATC API with compatible library**

OS-9 RTOS

- . REAL-TIME KERNEL**
- . UNIFIED I/O**
- . MULTI-TASKING**
- . UNIX-LIKE API**
- . HAWK DEVELOPMENT IN C, C++**





DEVICE DRIVERS

- **Storage:** **Non-volatile & volatile Ramdisks**
- **Comms:** **Synchronous & Asynchronous serial**
- **Clock/Timers:** **Calendar / DST; hardware timers;
clock synchronization**
- **Peripheral Devices:** **LCD display; activity LED; field I/O;
power fail handling**
- **Network:** **Ethernet**

EXAMPLE “C” CODE SAMPLE

❖ **Open the LED device named “/led”**

```
_os_open("/led", S_IREAD/S_IWRITE, &led_path);
```

❖ **Turn on LED device**

```
char led_state = 1;      /* state = ON */  
u_int32 count = 1;      /* send one byte to driver */  
_os_write(led_path, &led_state, &count);
```

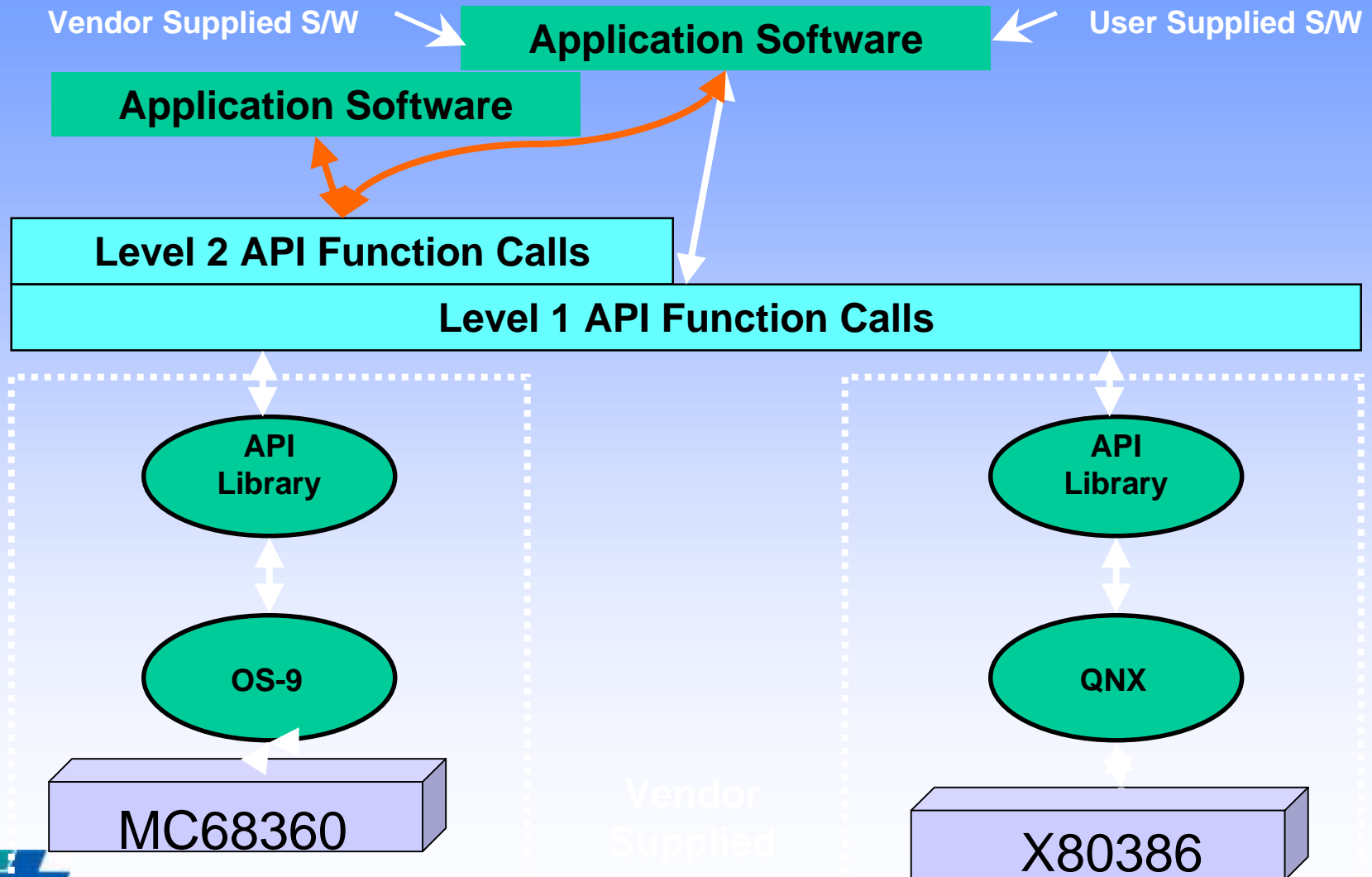
❖ **Turn off LED device**

```
led_state = 0;  
count = 1;  
_os_write(led_path, &led_state, &count);
```

❖ **Close LED device**

```
_os_close(led_path);
```

Application Programming Interface



SESSION 1.3

CENTRAL PROCESSOR UNITS (CPU) AND VME SYSTEM

DAVE MILLER



2070 & ITS CABINET WORKSHOP - AUGUST 2001

CENTRAL PROCESSOR UNITS (CPU)

- **CPU is the “BRAINS” of the 2070 ATC**
- **Includes microprocessor, memory and mass storage**
- **Currently, two CPU versions, 2070-1A and 2070-1B**
- **2070-1A: Two board version with parallel expansion**
- **2070-1B: One board version with serial expansion**
- **Planned, 2070-1C: Processor and OS independent**



2070-1A & 2070-1B COMMON FEATURES

- **Memory Types and Capacities**
 - 4 Megabyte minimum FLASH drive
 - 512 Kbytes minimum capacitor-backed SRAM
 - 4 Megabytes minimum DRAM
- **68360 Microprocessor, 24.576 MHz**
- **Time of day (TOD) clock, including day, date**
- **Super capacitor backup for TOD and SRAM, 10 days min when removed from controller, 30 days min when installed**
- **OS-9 operating system with 2070 extensions**
- **Data_Key holder and removable data_key**



2070-1A TWO BOARD CPU



2070-1A CPU

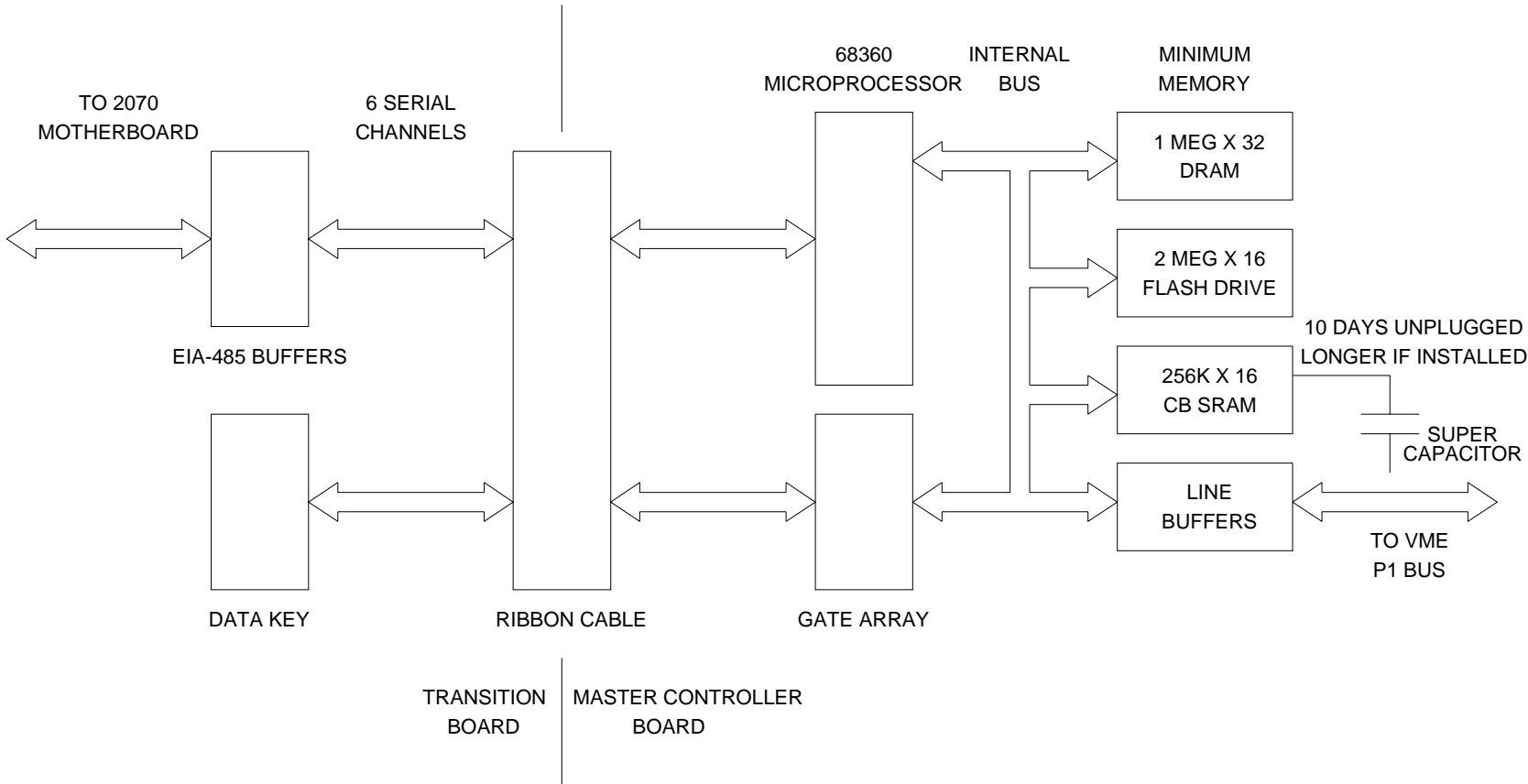
VME MCB



TRANSITION BOARD



2070-1A CPU BLOCK DIAGRAM

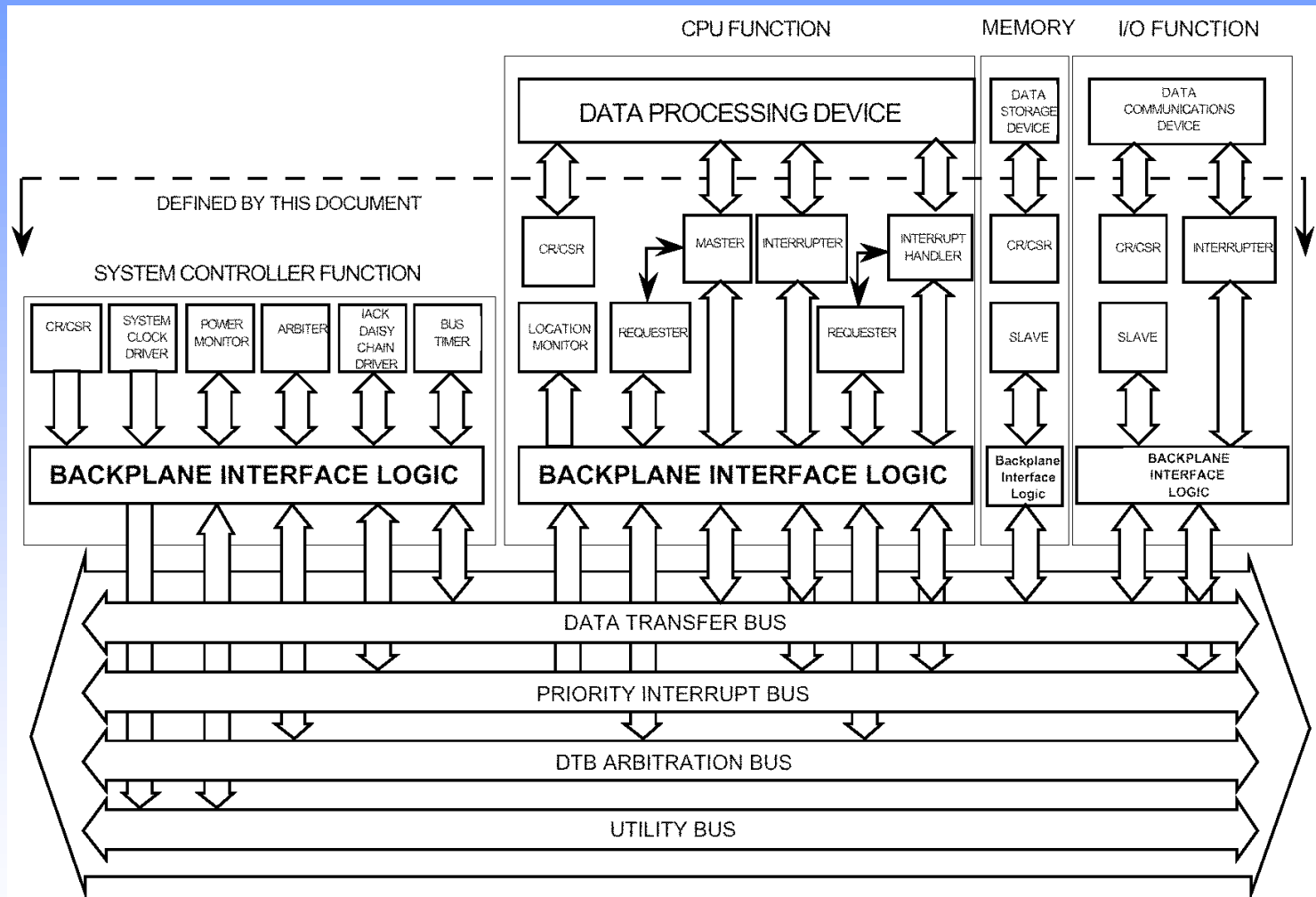


2070-1A CPU VME EXPANSION

- Expansion via parallel Versa Module Europe (VME) bus
- VME is a worldwide standard for hardened computers
- Used in military, petrochemical and robotic applications
- P1 8/16/32/64-bit multi-processor, bus request/grant
- 3U half-height with 96 pin DIN connector
- 2070-1A MCB occupies one slot, 4 spare expansion slots
- Hundreds of standard VME modules from multiple vendors (see www.vita.com for listing of vendors and products)



2070-1A VME P1 BUS (96 PINS)



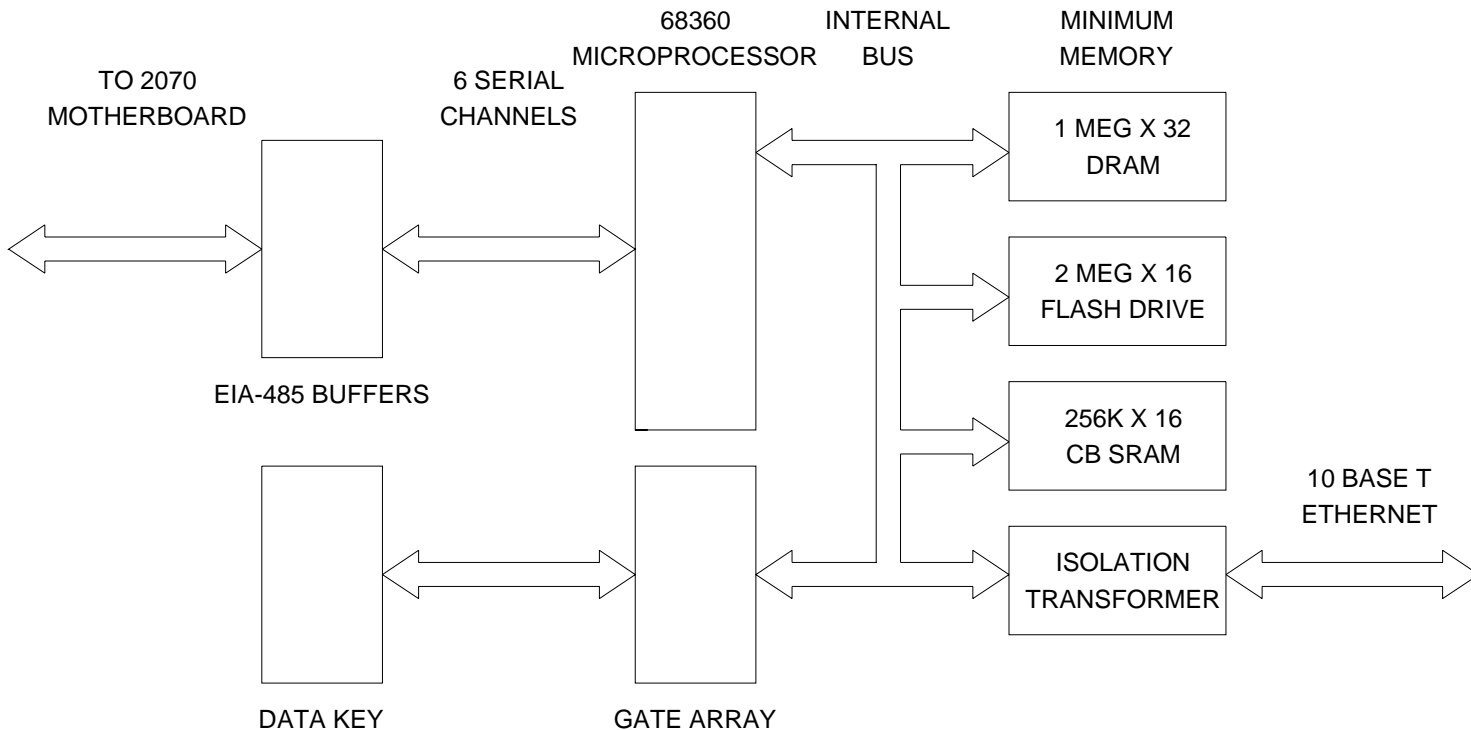
VME INTEGRATION

- **VME modules require special software drivers**
- **Similar to installing new hardware in personal computer**
- **User is responsible for installation of software driver**
- **Be aware that some VME modules do not have OS-9 drivers**

2070-1B SINGLE BOARD CPU



2070-1B CPU BLOCK DIAGRAM



SINGLE BOARD TAKES PLACE OF TRANSITION BOARD

2070-1B CPU ETHERNET EXPANSION

- **Expansion via serial 10 Base-T Ethernet**
- **10 Mega bits per second communications rate**
- **Built-in RJ-45 connector on 2070-1B face plate**
- **Built-in Internet Protocol (IP) address for each CPU**
- **Hundreds of add-on devices from multiple vendors**
- **Commonly used with fiber splitter / Ethernet hub in cabinet**



TRADITIONAL TYPE 170 CPU OPERATION

- **Controller handles single application (traffic, ramp etc)**
- **Application object code located in PROM memory device**
- **Application executes directly from PROM memory device**
- **Software updated by reprogramming PROM memory device**
- **Software is developed for specific microprocessor, must be rewritten when hardware becomes obsolete**

2070 ATC CPU OPERATION

- Operates as a general purpose computer
- Patterned after the IBM PC architectural model, except hardened for unattended operation in harsh environment
- Like a PC, multiple applications stored in FLASH drive
- Application software launched from drive, similar to .BAT
- Like a PC, software is loaded from drive to DRAM
- Application in DRAM accesses drive for data storage
- Like a PC, software is compatible with new hardware & OS



FREEWAY MANAGEMENT EXAMPLE

- **Freeway management code is stored in FLASH drive**
- **2070 ATC boots and loads freeway mgmt code into DRAM**
- **2070 ATC continually computes volumes and occupancy**
- **In case of power fail, calculations are stored in CB SRAM**
- **Every 15 min, results are stored to file in FLASH drive**
- **File can be uploaded to central and pasted into WORD doc**
- **Other applications may reside in FLASH drive, ie RAMP**

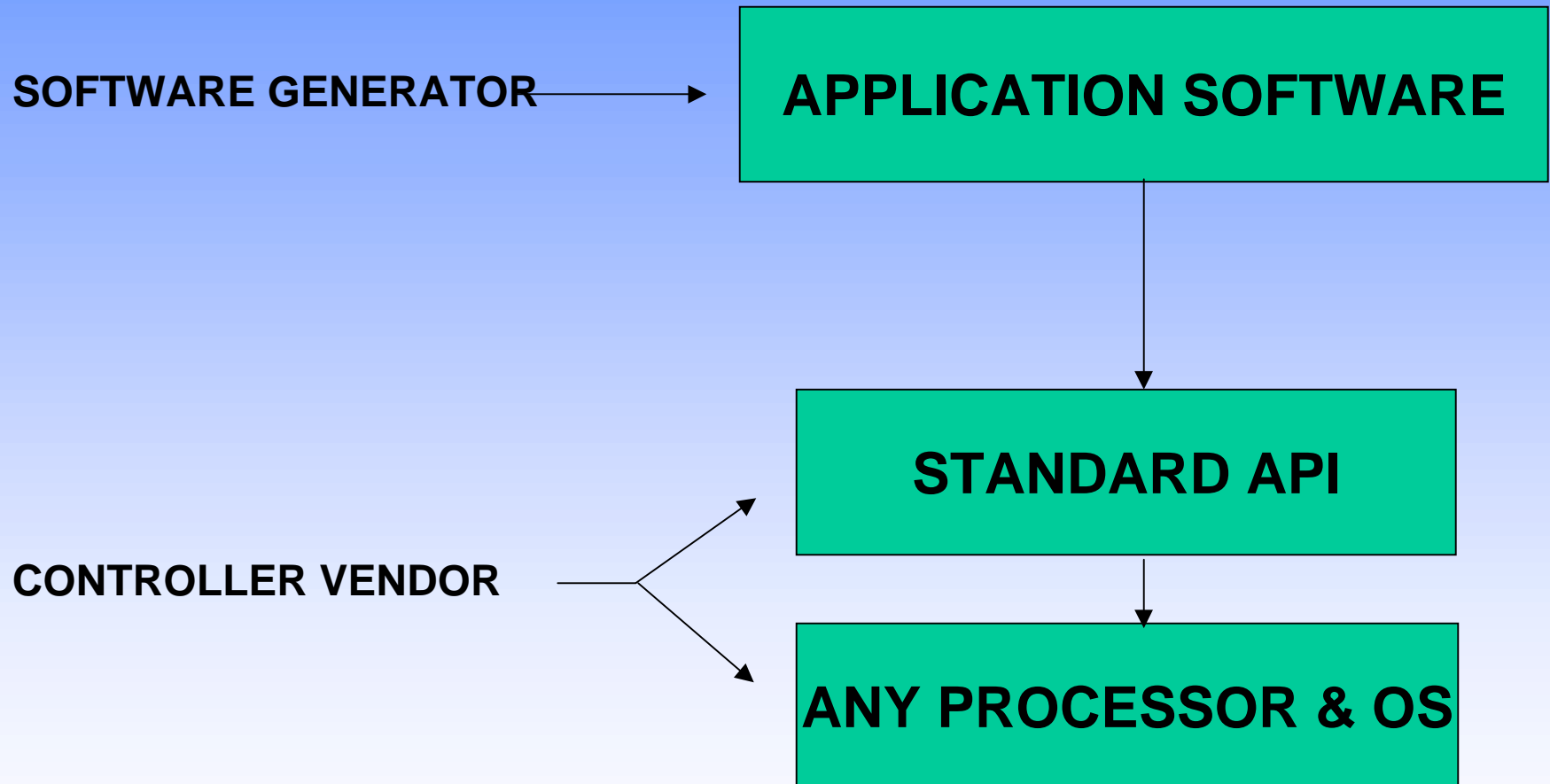


FUTURE 2070-1C CPU

- **Next generation CPU for 2070 ATC, new CALTRANS & NEMA/AASHTO/ITE development specification**
- **Hardware and operating system independent**
- **Upon completion of Application Program Interface (API) OS-9 not required, uses any operating system**
- **Upon completion of API, 68360 not required, uses any processor meeting performance specification**
- **Performance specification for multiple application**
- **Compatible with all software developed for 2070**



2070-1C APPLICATION PROGRAM INTERFACE (API)



SESSION 1.4

MODEL 2070 - 2A & 2B FIELD I/O MODULES

CLYDE NEEL



PURPOSE

2070-2A

- **170 COMPATIBLE I/O TO INTERFACE HOST CABINET**
- **I/O PROCESSING AUGMENTS MAIN CPU**

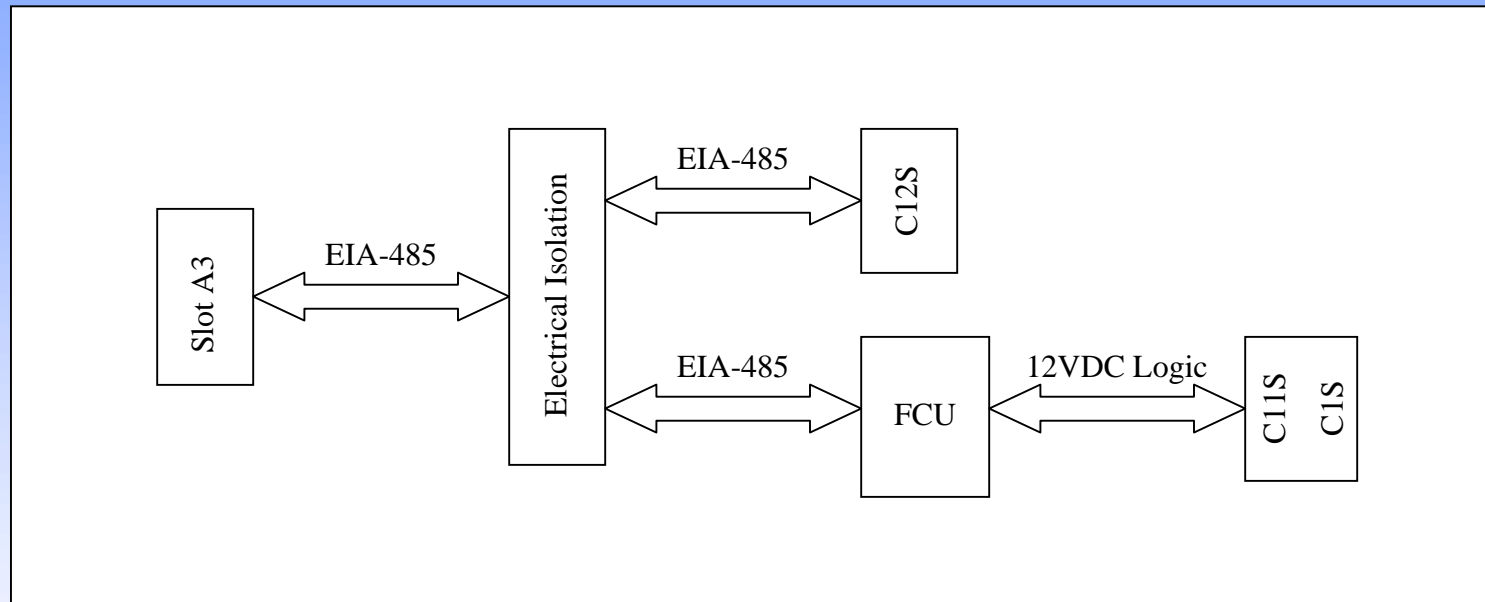
2070-2B

- **INTERFACE ITS CABINET SERIAL BUSES 1 AND 2**
- **CONNECT 2070-8 NEMA INTERFACE UNIT**

2070-2A FEATURE SUMMARY

- **PARALLEL I/O – 64 INPUTS, 64 OUTPUTS**
- **MODULE CONTROL UNIT - FIELD I/O FUNCTIONS**
- **SYNCHRONOUS SERIAL INTERFACES TO CPU
SP5**

2070-2A BLOCK DIAGRAM



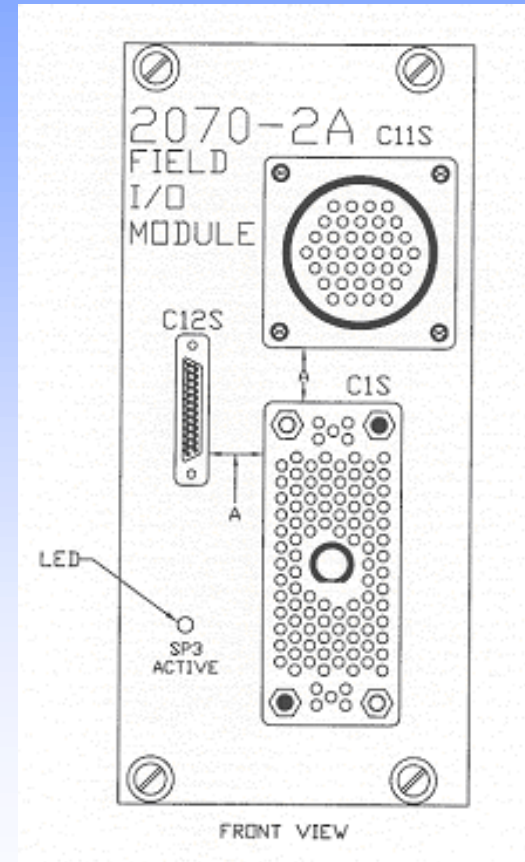
2070-2A FRONT PANEL FEATURES

C1S / C11S

- **170 COMPATIBLE**
- **64 INPUTS**
- **64 OUTPUTS**
- **ISOLATED 12VDC**

C12S

- **SERIAL SP5 AND SP3**
- **LINESYNC, AC FAIL, AND RESET**
- **ISOLATED EIA485**



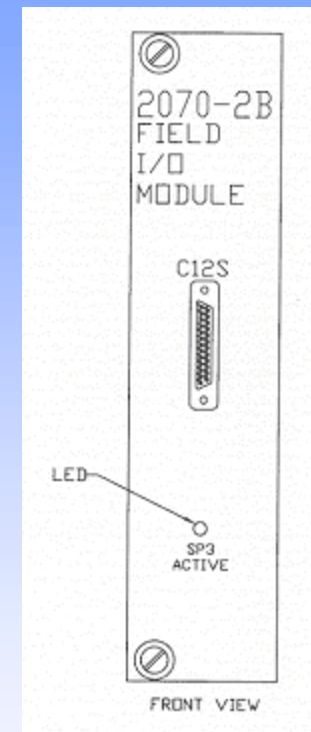
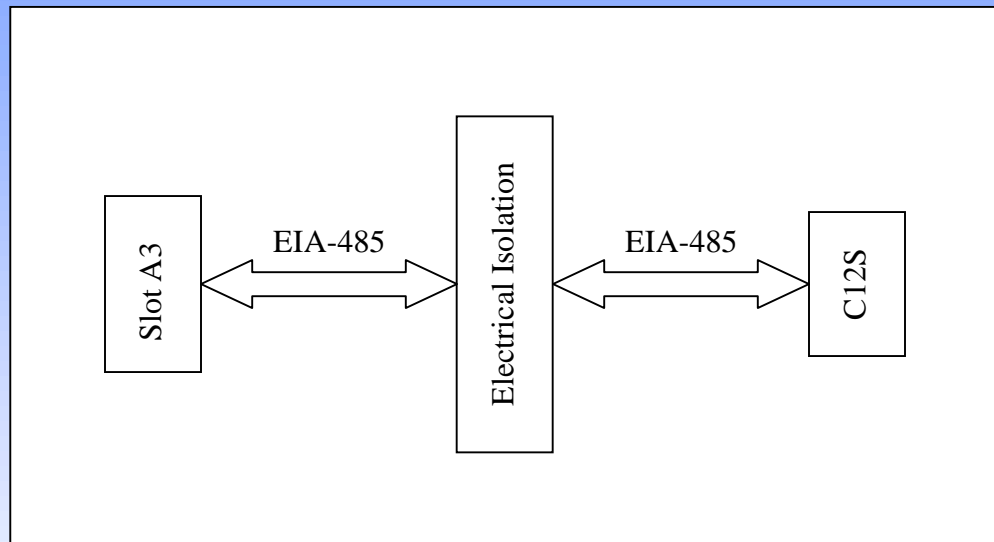
2070-2A PROCESSING

- **FIELD CONTROL UNIT**
 - **EMBEDDED PROCESSOR**
 - **DIAGNOSTICS**
- **INPUTS**
 - **1MS RESOLUTION**
 - **CONFIGURE FILTERING**
 - **BUFFERED TRANSITION MONITORING**

2070-2A PROCESSING

- **OUTPUTS**
 - **TRACKING INPUTS**
 - **SINGLE AND CONTINUOUS PULSE**
 - **GATED AND TRIGGERED**

2070-2B DIAGRAM AND PANEL



SESSION 1.5

FRONT PANELS AND “B” BOX ASSEMBLY

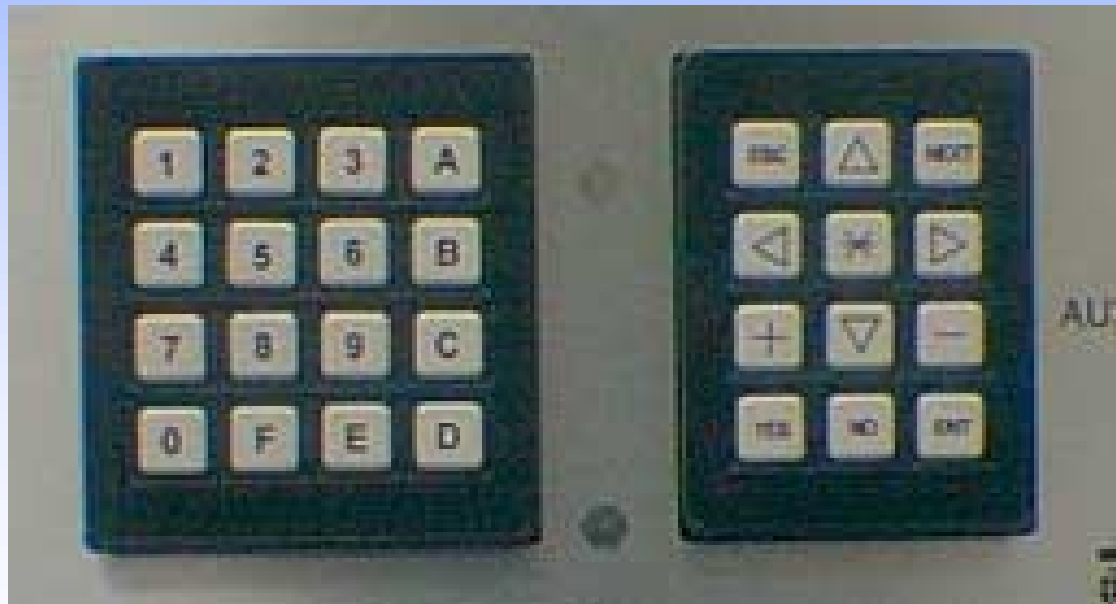
RALPH BOAZ



- **THREE MODELS FOR THE 2070 FRONT PANEL**
 - **2070-3A USES 1/2 INCH CHARACTER 4X40 LCD DISPLAY AND KEYPADS**
 - **2070-3B USES 1/4 INCH CHARACTER 8X40 LCD**
 - **2070-3C NOT DISPLAY OR KEYPADS**

- **LCD FOR THE 2070-3A & 2070-3B MODELS**
 - **4X40 OR 8X40 ELECTRO-LUMINESCENT (EL) BACKLIT DISPLAY**
 - **ILLUMINATES WHEN A KEY IS PRESSED**
 - **CONTRAST CONTROL**
 - **5X8 DOT MATRIX CHARACTERS INCLUDING UNDERLINE**

- **KEYPADS FOR THE 2070-3A & 2070-3B MODELS**
 - **4X4 KEYPAD FOR ALPHANUMERIC ENTRY**
 - **4X3 KEYPAD FOR CURSOR CONTROL AND SYMBOL ENTRY**



- **OTHER FEATURES**
 - **CPU ACTIVE LED**
 - **BELL**

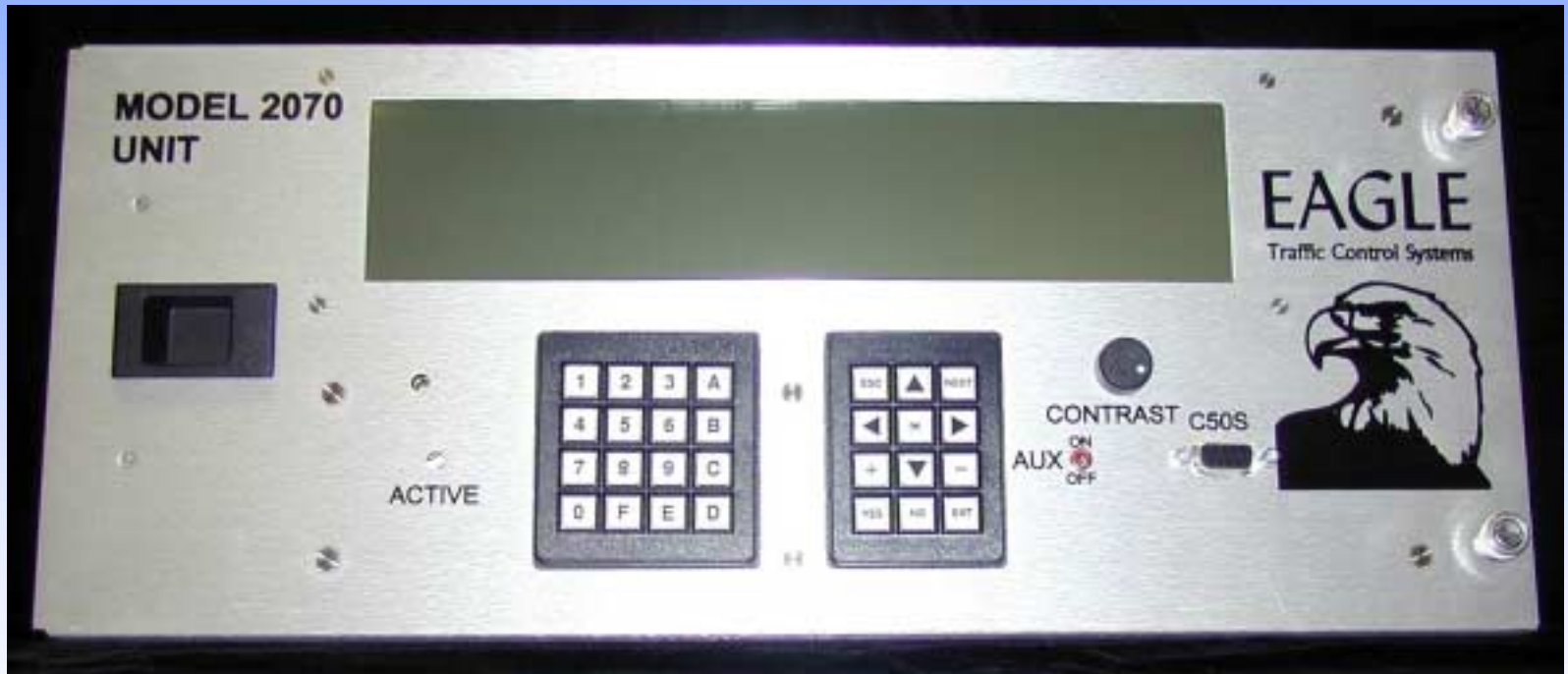


- **OTHER FEATURES (CONT.)**
 - **AUXILIARY SWITCH**
 - **C50S CONNECTOR FOR SOFTWARE INSTALLATION AND MANAGEMENT**
 - **VT-100 STANDARD INTERFACE**
 - **INTERCHANGEABLE**



- **2070-3C MODEL**
 - **BLANK PANEL**
 - **ADDS C60P CONNECTOR FOR LAPTOP, PDA, OR A “B-BOX”**
 - **VT-100 STANDARD TERMINAL**
 - **COST EFFECTIVE**

- 2070-3A



- **2070-3B AND “B” BOX ASSEMBLY**



- 2070-3C



SESSION 1.6

MODEL 2070-4 POWER SUPPLY UNITS AND INTERNAL INTERFACE

- 2070-4 POWER SUPPLY UNITS CONSIST OF TWO MODELS 4A AND 4B
- INTERNAL INTERFACE CONSIST OF SERIAL BACKPLANE MOTHERBOARD

RON JOHNSON

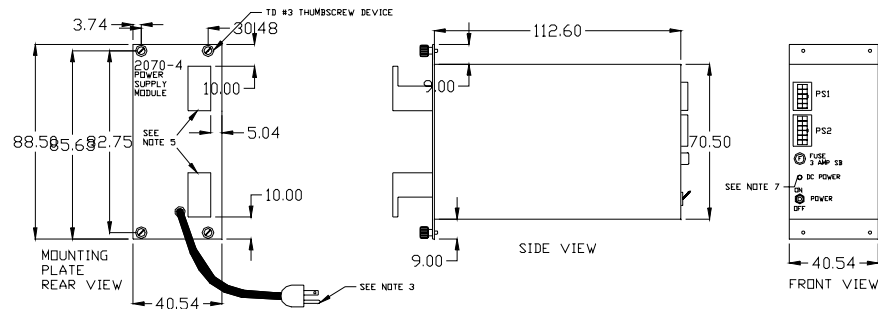
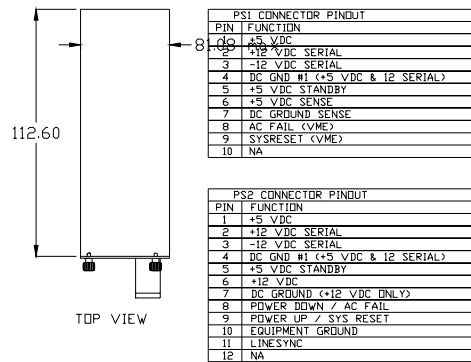


2070-4 UNIT POWER SUPPLIES 4A AND 4B

- **4A HAS A 10 A +5VDC POWER SUPPLY USED WHEN THE VME CAGE ASSEMBLY IS PRESENT.**
- **4B HAS AN 3.5A +5VDC POWER SUPPLY USED ON THE 2070 LITE CONTROLLER UNIT (NON VME).**
- **BOTH HAVE ADDITIONAL VOLTAGE OUTPUTS, +/-12 VDC COMM AT 0.5A AND +12VDC AT 1A, ISOLATION VOLTAGE FOR I/O 2B MODULE.**
- **+5VDC STANDBY POWER TO HOLD UP AT 600 μ A FOR A MINIMUM OF 600 MINUTES.**
- **POWER CONTROL CIRCUITRY TO PROVIDE SYSTEM POWER DOWN-POWER UP OPERATION.**
- **60 HZ LINESYNC**
- **HOLDOVER FOR 0.5 SECOND FOR 30 WATTS TO KEEP THE SYSTEM OPERATING DURING SHORT OUTAGES.**

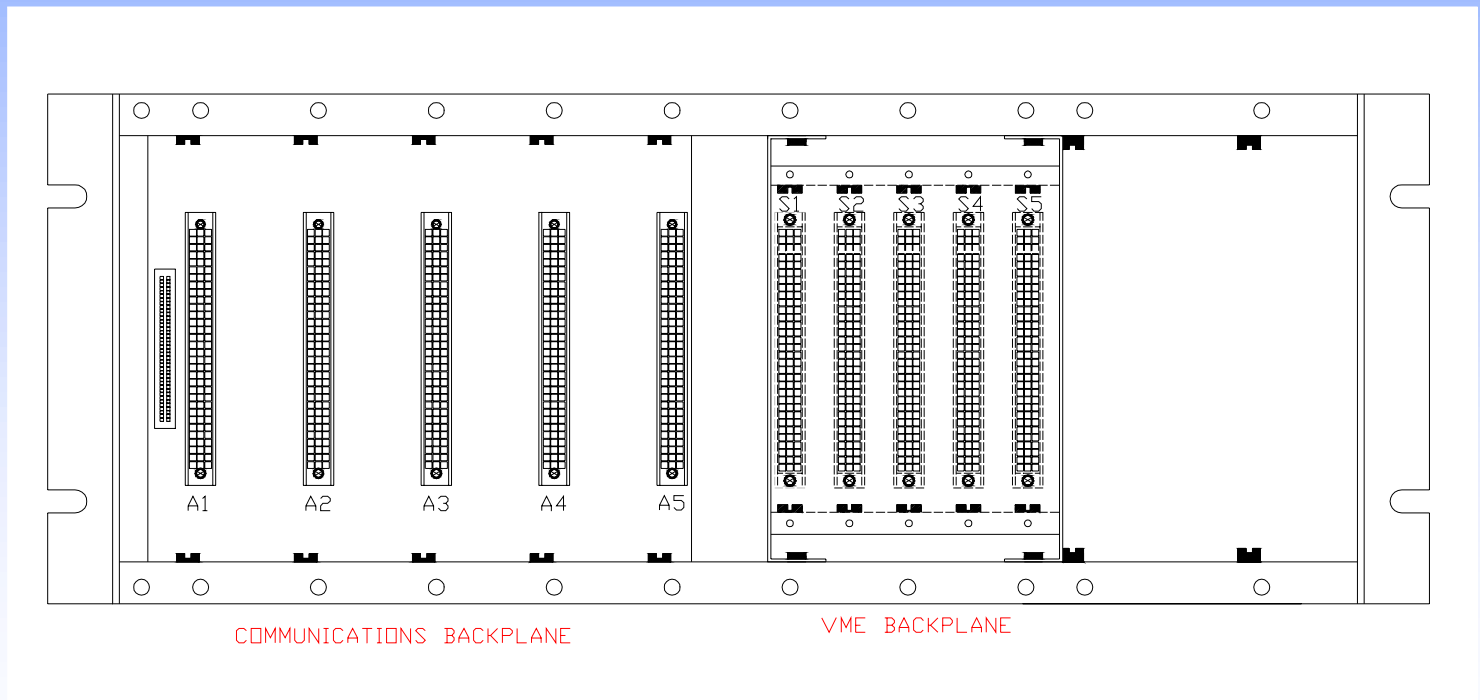


4A AND 4B POWER SUPPLIES CONTINUED



INTERNAL INTERFACE

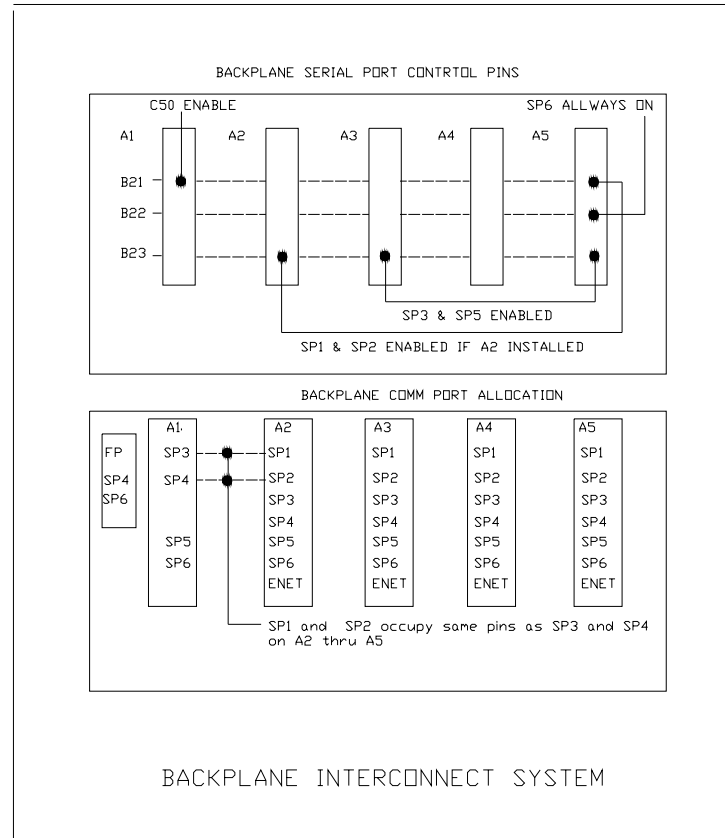
- THE COMMUNICATIONS BACKPLANE CONSISTS OF 5 CONNECTORS.
- A1 REPLACES SERIAL PORTS 1 AND 2 WITH 3 AND 4
- A2 - A5 SUPPORT ALL SERIAL PORTS INCLUDING ENET



SERIAL CONTROL AND INTERFACE

- **THE SERIAL MOTHERBOARD CONSISTS OF 5 “DIN 96 PIN” CONNECTORS ARRANGED AS A1 - A5 AND A 40 PIN HEADER LABELED FP CONNECTOR.**
- **A2 - A5 ARE PARALLEL WIRED TO SUPPORT THE 6 SERIAL PORTS AND CONTROL SIGNALS AND ETHERNET NETWORK.**
- **A1 IS UNIQUE. IT SUPPORTS SERIAL PORTS 3 AND 4 AT THE SAME PIN LOCATIONS IN LIEU OF SERIAL PORTS 1 AND 2.**
- ***THE OBJECTIVE IS TO OPERATE MODEM MODULE IN EITHER SLOTS WITHOUT SPECIAL PIN SELECTION.***

BACKPLANE INTERCONNECT SYSTEM



SESSION 1.7

2070 COMMUNICATIONS MODULES

FLOYD WORKMON



- **THE 2070 INTERNAL BUS PROVIDES 6 SERIAL EIA 485 PORTS PLUS / “ETHERNET” NETWORK**
- **CONNECTIONS A1 - A4 AVAILABLE FOR COMM MODULES**
- **AS NOTED, PORTS 5 AND 6 TYPICAL ASSIGNED TO UNIT FUNCTIONS**
- **PORTS 3 & 4 ARE MULTI-USED**
- **PORTS 1 & 2 (PLUS ETHERNET) AVAILABLE FOR CONTROL AND INT/EXT COMMUNICATION.**

- **4 COMM MODULES SPECIFIED IN CURRENT TEES DOCUMENT**

- **MODEL 2070-6A**
- **MODEL 2070-6B**
- **MODEL 2070-7A**
- **MODEL 2070-7B**

**FIBER OPTIC COMM MODULE
AVAILABLE**

MODEL 2070-6D



- **6A TWO CHANNEL ASYNC MODEM MODULE (LIKE 170 MODEL 800) HALF/FULL DUPLEX 1200 BPS INTERFACES WITH TELEPHONE VOICE GRADE AND DIRECT LINE**
- **6B TWO CHANNEL ASYNC MODEM HALF/FULL DUPLEX UP TO 9600 BPS INTERFACES WITH CONDITIONED TELEPHONE AND DIRECT LINE.**
- **7A TWO CHANNEL ASYNC / SERIAL COMM MODULE INTERFACE EXTERNAL EIA/TIA 232**
- **7B TWO CHANNEL ASYNC / SYNC COMM MODULE INTERFACE EXTERNAL EIA/TIA 485**

- **OTHER MODULES EITHER EXISTING OR PENDING**
 - **2070-6C 1 CHANNEL AUTO DIAL**
1 CHANNEL 400 MODEM
 - **2070-6D 2 CHANNEL FIBER OPTIC**

SESSION 1.8

CALTRANS ATC DAT V 1.0

HARRISON LAM



2070 & ITS CABINET WORKSHOP - AUGUST 2001

CALTRANS ATC DAT V 1.0

- **DEFINITIONS:**

ATC -

ADVANCE TRANSPORTATION CONTROLLER UNIT

DAT -

DIAGNOSTIC ACCEPTANCE TESTS

V 1.0

VERSION 1



CALTRANS ATC DAT V 1.0

- **ATC DAT V 1.0 IS COMPOSED OF
THE EAGLE VALIDATION PROGRAM
AND L.A. DOT TEST PROGRAMS WITH
CERTAIN EDITS**
- **IT IS TARGETED FOR SEPT. 2001 RELEASE**



TESTS:

- TIME-OF-DAY CLOCK & TIMING FUNCTIONS
- SERIAL COMMUNICATIONS
- FIELD I/O (INPUT/OUTPUT)
- SRAM / DRAM MEMORIES
- FLASH MEMORY
- FRONT PANEL ASSEMBLY TEST PROGRAM
- FIELD INPUT / OUTPUT TEST PROGRAM
- INTERNAL TIMERS
- SYSTEM INTERRUPTS & LOGIC FUNCTIONS

LOAD, START

- **USE ANY COMMUNICATION PROGRAM THAT COMES WITH THE KERMIT PROTOCOL**
WE USE MS WINDOWS HYPERTERMINAL
 - * **CONNECT THE 2070 TO THE PC BETWEEN C50S PORT OF THE 2070 WITH COM PORT OF THE LOADING PC**
DEFAULT PORT RATE 9600 BPS
LOAD ATC DAT V 1.0 PROGRAM FILES
POWER ON/OFF
PROGRAM AUTOMATICALLY STARTS

SESSION 1.9

CALTRANS 2070 TESTING FOR QPL ACCEPTANCE

DAVID WELLS



2070 & ITS CABINET WORKSHOP - AUGUST 2001

2070 TESTING

- **PHYSICAL INSPECTION**
- **SOFTWARE INSPECTION**
- **DIAGNOSTIC ACCEPTANCE TESTS**
- **POWER SUPPLY TESTS**
- **ENVIRONMENTAL TESTS**
- **ETHERNET**

PHYSICAL INSPECTION

- **ENSURE ALL DELIVERABLES ARE WITH CONTROLLER**
- **PHYSICAL DIMENSIONS ARE CORRECT**
- **COMPONENTS ARE PROPERLY LABELED**
- **PARTS ARE NO OLDER THAN 3 YEARS**

SOFTWARE INSPECTION

- **ENSURE ALL SOFTWARE MODULES ARE PRESENT**
- **DAYLIGHT SAVINGS**
- **OS-9 VERSION**
- **MEMORY**
- **BOOT UP TIME**
- **TEST ASYNCHRONOUS COMMUNICATION ON EIA-232 AND 485 PORTS**

DIAGNOSTIC ACCEPTANCE TESTS

- **SERIAL PORT LOOPBACK**
- **FIELD IO LOOPBACK**
- **MEMORY (FLASH/DRAM/RAM)**
- **REAL TIME CLOCK**

POWER SUPPLY TESTS

- **POWER SUPPLY VOLTAGES AND LOAD TESTING**
- **ACFAIL AND SYSRESET TIMING SIGNALS**
- **EFFICIENCY**
- **LINESYNC**
- **SHORT OUT**

ENVIRONMENTAL TESTS

- **LOAD AND RUN CALTRANS TRAFFIC CONTROL SIGNAL PROGRAM**
- **TEMPERATURE TESTING +74 C AND -37 C**
- **2 KVA TEST**
- **FRONT PANEL KEYBOARD TEST**

ETHERNET - 2070 LITE ONLY

- **TELNET TO CONTROLLER USING ETHERNET**
- **ADDITIONAL ETHERNET MODULES ARE PRESENT**

SESSION 2

APPLICATION PROGRAMS

FLOYD WORKMON



SECTION 2.1

INTRODUCTION

- JOINT SOFTWARE GROUP
 - LEGAL BOUND
 - * TRAFFIC SIGNAL CONTROL PROGRAMS APPLICATION
 - * CALTRANS, TEXAS DOT, LA CITY, IRVINE CITY
- AVAILABLE OPEN MARKET PROGRAM



SESSION 2.2

AGENCY LOCAL INTERSECTION PROGRAM

GEORGE CHEN



2070 & ITS CABINET WORKSHOP - AUGUST 2001



Type 2070 Controller Software By City of Los Angeles

Traffic Signal Control Program (TSCP) Transit Priority System (TPS) Startup Manager





Traffic Signal Control Program (TSCP) Overview

Installation

- 500 installed city-wide since 1997
- Used transit priority control intersections
- Used in complex intersection's traffic signal operations
- Used in CDPD communications enabled intersections

Enhancement to current ATSAC and ATCS systems in LADOT

- Compatible with existing infrastructures
- 16 System detectors per controller
- Communicate with UTCS systems
- Integrate with Light Rail System





TSCP Software Features

Signal Control

- Eight-phase, dual-ring operation
- Restricted phase operation
- Six overlap with programmable parent, omit and no-start phases
- Programmable detector inputs and load-switch outputs
- Pedestrian service on all phases
- Volume density operation
- User programmable software logic
- Local Critical Intersection Control (CIC)

Coordination

- Nine local plans
- Four “On-Line” ATSAC plans
- Free and Flash operation
- Lead-lag operation by plan
- Sync phase, hold phase, and phase omit by plan
- 7-wire and Simplex modem master and slave operation
- Complex modem master and slave operation
- Plan verification prior to operation





TSCP Software Features Continued

Time-of-Day

- Separate control for Time-of-Day functions and plan selection
- Six plan selection tables, each with 16 plan entries
- 16 fixed and 16 floating holidays
- Extensive “look-back” feature for plan selection
- Automatic Daylight Saving correction
- Solar clock and Hebrew calendar for sabbatical pedestrian recall

Detectors

- 32 programmable detectors (vehicle, bicycle or pedestrian)
- Up to 16 system detectors
- Vehicle detectors assignable to both phase and function
- Count, delay and extend timing on all detectors
- Red and yellow lock by detector
- Failure monitoring with automatic phase recall
- Failure recall times by detector





TSCP Software Features Continued

Communications

- Compatible with ATSAC system
- Compliant with AB3418 protocol
- Supports external WWV time clock
- Compatible with simplex modem system (master and slave)
- New complex modem system (master and slave) with time and plan
- High speed EIA-232 (up to 38.4K bps)
- Programmable parity, data and stop bits

Transit Priority

- Programmable green extension and early green
- Programmable number of inhibit cycles
- Priority phase hold during free operation

Preemption

- Two railroad and four emergency vehicle preempts
- Latching or non-latching preempt inputs
- Fully programmable delay, clearance, hold and exit phases and overlaps
- Three clearance intervals for railroad preempts
- Maximum emergency vehicle preempt timer

Diagnostics and Utilities

- Event logging of all special conditions
- Input, output display and keyboard tests
- RAM checksums for each timing chart page
- Copy feature for phase timing, local plans, time-of-day tables and transit priority data





TSCP Operations

Main Menu:

TSCP MAIN MENU		
1-Displays	4-Commands	7-Coordination
2-Controller	5-Detectors	8-TOD Schedule
3-Preemption	6-Comm/Logic	9-Utilities

Phase Timing Display:

PHASE TIMING				Pg 1/2
Phs	Interval	Time	Max	Demand
2	GREEN REST	0.0	20	VEH .2...6..
6	GREEN REST	0.0	20	PED

Communications Menu:

COMMUNICATIONS DISPLAY	
1-ATSAC Protocol	4-AB3418 Status
2-Simplex Protocol	5-WWV Protocol
3-Complex Protocol	

Detector Menu:

DETECTOR DISPLAY MENU	
1-Vehicle Counts	4-Failed Detectors
2-Delay Timers	5-System Det Data
3-Extend Timers	



TSCP Operations

Utility:

RAM CHECKSUM

Page 2 = XXXX Page 4 = XXXX
Page 3 = XXXX Page 5 = XXXX
Pages referenced to Timing Chart

Cabinet Configuration:

CABINET STATUS INPUT CONFIGURATION

Input	Port	Input	Port
Flash Bus	>2.8<	Flash Sense	6.7
Door Ajar	6.1	Stop Time	6.8

CIC Menu:

CIC PARAMETERS

1-CIC Enable
2-CIC Parameter Values
3-Detector-to-Phase Assignment

Solar Clock Menu:

SOLAR CLOCK DATA

North Latitude	> 34<	Today's Times
West Longitude	118	Sunrise 05:38:10
Local Time Zone	8	Sunset 16:52:14



TSCP Timing Chart

CITY OF LOS ANGELES - DEPARTMENT OF TRANSPORTATION				STANDARD TIMING CHART FOR TYPE 8003 CONTROLLER - TSCP 3.4x		Page 1 of 5							
<p>Location: MAPLE AV & WASHINGTON BL</p> <p>System: LIGHT RAIL</p> <p>Master At: ATISAC CENTER - CITY HALL EAST</p> <p>Designed By: SKIDMORE</p> <p>Approved By: SKIDMORE</p>				<p>District: CENTRAL</p> <p>I/O: CHBLE</p> <p>Installed By:</p> <p>Service Info: RR TO PER M/S MC</p>									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>Timing Change</td> <td>Supersedes</td> <td>Designed</td> <td>Installed</td> <td>Turned On</td> </tr> <tr> <td></td> <td>12/12/2000</td> <td>09/11/2001</td> <td></td> <td></td> </tr> </table>				Timing Change	Supersedes			Designed	Installed	Turned On		12/12/2000	09/11/2001
Timing Change	Supersedes	Designed	Installed	Turned On									
	12/12/2000	09/11/2001											
<p>PHASE</p> <p>1) WASHINGTON BL W/B LEFT TURN</p> <p>2) WASHINGTON BL E/W S 1/2 PER KING</p> <p>3)</p> <p>4) MAPLE AV W/B & E/S PER KING</p> <p>5) WASHINGTON BL E/W LEFT TURN</p> <p>6) WASHINGTON BL W/B & W/S PER KING</p> <p>7)</p> <p>8) MAPLE AV S/W & W/S PER KING</p> <p>DISCLAP</p> <p>A)</p> <p>B)</p> <p>C)</p> <p>D)</p> <p>E)</p> <p>F)</p> <p>LRT</p> <p>A) LRT W/B</p> <p>B) LRT E/W</p>				<p>FLASH</p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>									
<p>Notes and comments:</p>													
<p>INTERSECTION NUMBERS</p> <table border="0" style="width: 100%;"> <tr> <td>ATISAC System: 881</td> <td>SAH Checksum</td> </tr> <tr> <td>ATISAC I/O #: 322</td> <td>Page 2 = 5306 Page 4 = 0421</td> </tr> <tr> <td>5-digit code: 00000</td> <td>Page 3 = 0000 Page 5 = 2000</td> </tr> </table>						ATISAC System: 881	SAH Checksum	ATISAC I/O #: 322	Page 2 = 5306 Page 4 = 0421	5-digit code: 00000	Page 3 = 0000 Page 5 = 2000		
ATISAC System: 881	SAH Checksum												
ATISAC I/O #: 322	Page 2 = 5306 Page 4 = 0421												
5-digit code: 00000	Page 3 = 0000 Page 5 = 2000												



TSCP Timing Chart

MAPLE AV & WASHINGTON BL (DE1-122) CS-5338

PAGE 2 OF 5

CONFIGURATION

Cabinet (2-1-1)

Type	112
Configuration	ATSAC

Phases (2-1-2)

Permitted	12-456-8
Restricted	

Overlays (2-1-3)

Overlay	Permit	Onst	No Start
A
B
C
D
E
F

Pedestrian (2-1-4)

1P	.....
2P	.....
3P	.....
4P	.....
5P	.....
6P	.....
7P	.....
8P	.....

Flashing Colors (2-1-5)

Yellow Flash Phases	.....
Yellow Flash Overlays	.....
Flash-to-Red Phases	.....
Flash-to-Red Overlays	.....

Startup (2-1-7)

First Green Phases	2-4-6-8
Startup Yellow Phases	.....
Startup Yellow Overlays	.....
Startup All-Red	5.0
Startup Vehicle Recall	1-4-5-8
Startup Pedestrian Recall	4-6-8

Special Operation (2-1-6)

Single Exit Phases	.....
Oncoming Signal Phases	.....
Oncoming Signal Overlays	.....

TIMING

Phase (2-2)

	#1	#2	#3	#4	#5	#6	#7	#8
Week 1	0	7	0	5	0	7	0	5
Week 2	0	0	0	0	0	0	0	0
Display Walk	0	0	0	0	0	0	0	0
Flash Don't Walk	0	1.8	0	1.7	0	1.7	0	1.7
Fixed Don't Walk	0	1	0	1	0	1	0	1
Minimum Green	5	1.0	0	5	5	1.0	0	5
Bike Green	0	0	0	0	0	0	0	0
Det Limit	0	0	0	0	0	0	0	0
Max Initial	0	2.5	0	0	0	2.5	0	0
Max Green 1	30	4.0	0	3.0	30	4.0	0	3.0
Max Green 2	0	0	0	0	0	0	0	0
Max Green 3	0	0	0	0	0	0	0	0
Extension	2.0	5.0	0.0	3.0	2.0	5.0	0.0	3.0
Maximum Gap	2.0	8.0	0.0	3.0	2.0	8.0	0.0	3.0
Minimum Gap	2.0	4.0	0.0	3.0	2.0	4.0	0.0	3.0
Appl Per Vehicle	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0
Reduce Gap By	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0
Reduce Every	0.0	2.0	0.0	0.0	0.0	2.0	0.0	0.0
Yellow	3.0	3.5	0.0	3.5	3.0	3.5	0.0	3.5
All-Red	1.0	0.5	0.0	1.5	1.0	0.5	0.0	1.5
All-Red	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Overlays (2-3)

	A	B	C	D	E	F
Min Green	0.0	0.0	0.0	0.0	0.0	0.0
Green Ext	0.0	0.0	0.0	0.0	0.0	0.0
Yellow	0.0	0.0	0.0	0.0	0.0	0.0
All-Red	0.0	0.0	0.0	0.0	0.0	0.0

Red Reset (2-8)

Time 2-8

COORDINATION

Press [P] key to select Green Factors or Force-Off

Local Plan (2-1-9)

	Cycle	Offset	Phase	#1	#2	#3	#4	#5	#6	#7	#8	Lag	Sync	Hold	Onst	Min	Max	Red	Blue
Plan 1	Green Factor	60	0	0	44	0	38	40	45	0	32	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan 2	Green Factor	60	0	0	44	0	38	40	45	0	32	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan 3	Green Factor	60	0	0	44	0	38	40	45	0	32	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan 4	Green Factor	60	0	0	44	0	38	40	45	0	32	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan 5	Green Factor	120	35	0	15	48	0	38	15	70	0	22	1-4-6-8	2-5-7	.....	.....	.....	.....	.....
Plan 6	Green Factor	120	35	0	15	48	0	38	15	70	0	22	1-4-6-8	2-5-7	.....	.....	.....	.....	.....
Plan 7	Green Factor	60	0	0	44	0	38	40	45	0	32	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan 8	Green Factor	105	45	0	13	56	0	38	13	58	0	22	1-4-6-8	2-5-7	.....	.....	.....	.....	.....
Plan 9	Green Factor	120	35	0	15	48	0	38	15	70	0	22	1-4-6-8	2-5-7	.....	.....	.....	.....	.....

ATSAC Plan (T-A-E)

	Lag	Sync	Hold	Onst	Min	Max	Red	Blue
Plan A	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan B	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan C	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....
Plan D	1-4-6-8	2-5-7	.....	.....	.....	.....	.....	.....

(T-E)

	Lag	Onst	Min	Max	Red	Blue
Free	1-4-6-8	.....	.....	.....	.....	.....

Green Band Protect (T-0)

Enabled 123456789ABCD

ATSAC Flags (T-F)

Breakdown Permit Yield	NO
Non-Left Turn Force-Off	.....
Cycle Controller Vehicle Call	4-6-8
Cycle Controller Pedestrian Call	.....

Special Function Overlays (2-2)

#	Control	#	Control
1	NORMAL	3	NORMAL
2	NORMAL	4	NORMAL

Inputs

7-Wire VC (2-1-6-1)

Enabled	NO	RI	3-8	Flow	3-6
Max On	256	RI2	3-5	D2	2-8
Max Off	256	RI3	3-7	D3	6-1

Cabinet Status (2-1-6-3)

Input	Port
Flash Bus	2-8
Door Alarm	6-1
Flash Sense	6-7
State Time	6-8

Special Function (2-1-6-4)

Input	Port
1	0-8
2	0-8
3	0-8
4	0-8

Manual Control (2-1-8-2)

Input	Port
Manual Advance	6-8
Advance Frame	2-7

Outputs

Loadswitch Assignment (2-1-9)

	A	1	2	32	31	4	24	37
D	5	4	36	32	8	28	8	
E	11	12	8	13	14	41	42	

Loadswitch Codes:

- 0 Unused (No output)
- 1-6 Vehicle 1-6
- 7-16 Overlap 4-7
- 21-28 Ped 1-8
- 41-47 Special Functions
- 51-57 Special Functions
- 71-72 Seven Wire VC

* made output of loadswitches 3 & 6

MANUAL COMMANDS

Manual Plan (4-1)	0
Detector Reset (4-2)	OFF
Local Manual (4-4)	OFF
Manual Plan 254 = FLUSH	
Manual Plan 255 = FREE	



Transit Priority System (TSP) Overview

Installation

- Two transit corridors in the City
- 212 TPS traffic signals installed city-wide since 2000

Enhancement to current TSM systems in LADOT

- Provide Traffic Signal Priority to MTA Rapid Buses
- Plan to Provide Traffic Signal Priority to Fire Department Vehicles
- No additional transition required after priority operation
- Priority response within one second of detection
- Early green, Green extension, and Phase hold priority mode





TPS Software Features

- User configurable priority parameters
- Communicates with up to four transponder detector units
- Automatic detector unit failure monitoring
- Support for detector unit configuration
- Detection simulation
- Valid transponder code programming
- High speed serial communications
- RAM check for timing chart data
- Configurable communications port





TPS Timing Chart

CITY OF LOS ANGELES - DEPARTMENT OF TRANSPORTATION				TPS TIMING CHART FOR TYPE 8250 CONTROLLER - TPS 1.xx				PAGE 1 OF 1																																																																													
Location: LAUREL CANYON BL & VENTURA BL System: VENTURA				District: EAST VALLEY		Designed By: SEKIAN Installed By: SEKIAN																																																																															
Timing Change 06/23/2000		Supersedes 05/03/1999		Designed 04/29/2000		Installed 05/03/1999				Turned On 05/03/1999																																																																											
CONFIGURATION <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Unit Address (3-1) <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <th>Unit</th> <th>R1</th> <th>R2</th> <th>R3</th> <th>R4</th> </tr> <tr> <td>Address</td> <td>1</td> <td>2</td> <td>3</td> <td>0</td> </tr> </table> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Loop/Comm Delay Parameters (3-2) <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Normal</td> <td>18</td> <td>Get Status</td> <td>18</td> </tr> <tr> <td>Request</td> <td>34</td> <td>Set Status</td> <td>18</td> </tr> <tr> <td>Error All</td> <td>240</td> <td>Code Data</td> <td>34</td> </tr> </table> </div> <div style="border: 1px solid black; padding: 5px;"> TPS Comm Config (3-3) TPS Comm Delay 17 (ticks/address) </div>					Unit	R1	R2	R3	R4	Address	1	2	3	0	Normal	18	Get Status	18	Request	34	Set Status	18	Error All	240	Code Data	34	COMM PARAMETERS <div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> 4-1 C2 <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Address</td> <td>0</td> </tr> <tr> <td>Protocol</td> <td>NOISE</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Baud</td> <td>1200</td> </tr> <tr> <td>Parity</td> <td>NOISE</td> </tr> <tr> <td>Data Bits</td> <td>8</td> </tr> <tr> <td>Stop Bits</td> <td>1</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>RTS On Time</td> <td>0</td> </tr> <tr> <td>RTS Off Time</td> <td>0</td> </tr> <tr> <td>Handshaking</td> <td>NOISE</td> </tr> </table> </div> <div style="width: 30%;"> 4-2 C20 <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Address</td> <td>0</td> </tr> <tr> <td>Protocol</td> <td>TPS COMM</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Baud</td> <td>1200</td> </tr> <tr> <td>Parity</td> <td>NOISE</td> </tr> <tr> <td>Data Bits</td> <td>8</td> </tr> <tr> <td>Stop Bits</td> <td>1</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>RTS On Time</td> <td>0</td> </tr> <tr> <td>RTS Off Time</td> <td>0</td> </tr> <tr> <td>Handshaking</td> <td>NOISE</td> </tr> </table> </div> <div style="width: 30%;"> 4-3 C21 <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Address</td> <td>0</td> </tr> <tr> <td>Protocol</td> <td>LOOP/COMM</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>Baud</td> <td>9600</td> </tr> <tr> <td>Parity</td> <td>NOISE</td> </tr> <tr> <td>Data Bits</td> <td>8</td> </tr> <tr> <td>Stop Bits</td> <td>1</td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td>RTS On Time</td> <td>0</td> </tr> <tr> <td>RTS Off Time</td> <td>0</td> </tr> <tr> <td>Handshaking</td> <td>NOISE</td> </tr> </table> </div> </div>					Address	0	Protocol	NOISE	Baud	1200	Parity	NOISE	Data Bits	8	Stop Bits	1	RTS On Time	0	RTS Off Time	0	Handshaking	NOISE	Address	0	Protocol	TPS COMM	Baud	1200	Parity	NOISE	Data Bits	8	Stop Bits	1	RTS On Time	0	RTS Off Time	0	Handshaking	NOISE	Address	0	Protocol	LOOP/COMM	Baud	9600	Parity	NOISE	Data Bits	8	Stop Bits	1	RTS On Time	0	RTS Off Time	0	Handshaking	NOISE
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Startup Manager

Select 2070 Startup Sequence

Save New Startup Sequence

Enable New Startup Sequence

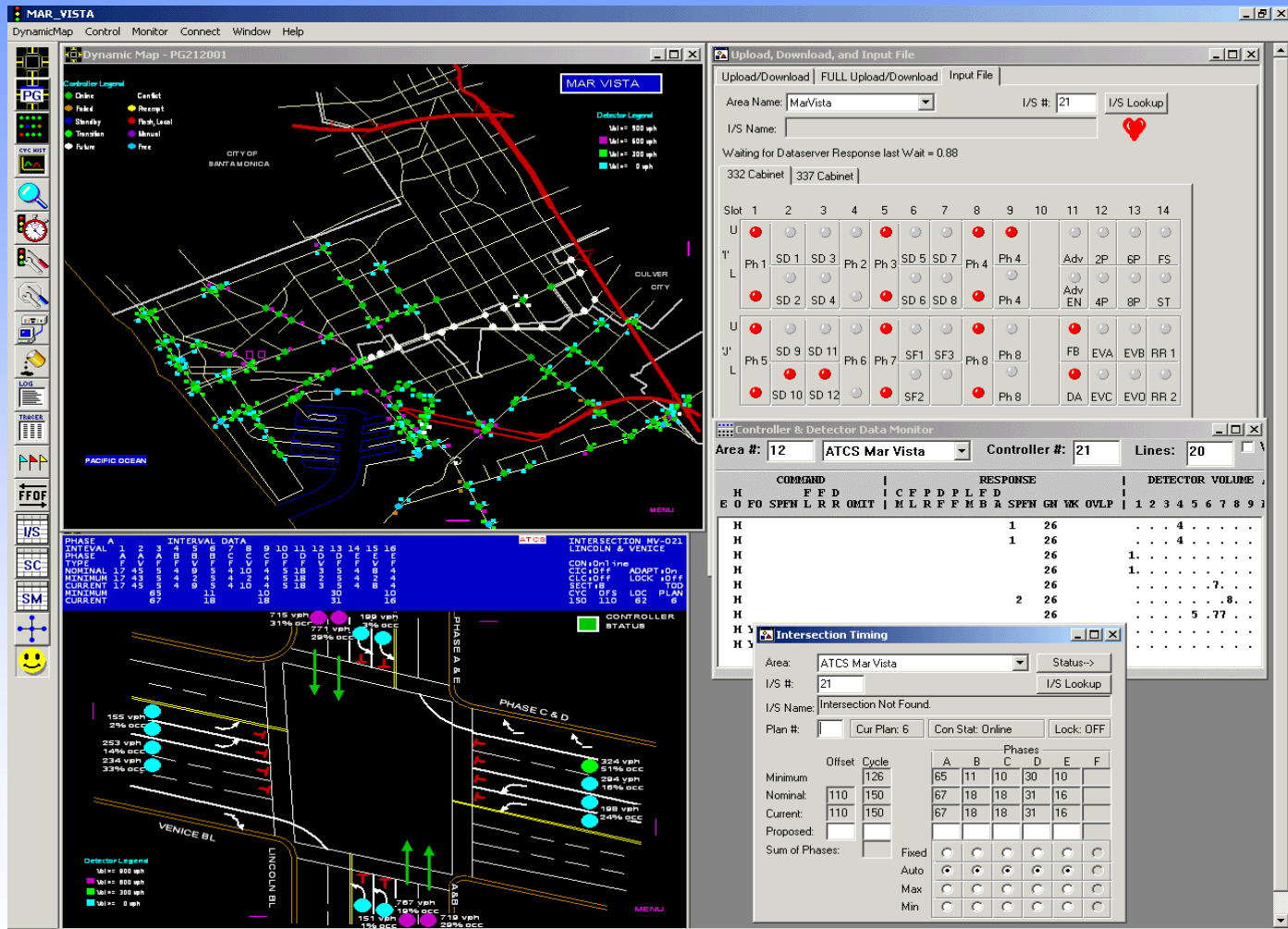


2070 & ITS CABINET WORKSHOP - AUGUST 2001



TSCP and ATCS

Integration with LADOT Adaptive Traffic Control System



2070 & ITS CABINET WORKSHOP - AUGUST 2001



TPS and TMS

Integration with LADOT Transit Management System





City of Los Angeles Department of Transportation

**George E. Chen
ATSAC Center
221 North Figueroa Street, Suite 300
Los Angeles CA, 90012**



2070 & ITS CABINET WORKSHOP - AUGUST 2001

SESSION 2.3

TRAFFIC SIGNAL CONTROL PROGRAM (TSCP) and UNIVERSAL RAMP METERING (URMS)

HERASMO INIGUEZ



2070 & ITS CABINET WORKSHOP - AUGUST 2001

URMS

- Legacy Support
- Network Communication
- Ramp Metering Algorithm
(selection/options)
- Distributed Program
- Modular Design
- 100% URMS Operational Requirements
- Incorporates a URMS Application Program Interface (API)



-LEGACY SUPPORT

- SATAMS and SDRMS Framing**
- Transparent to Legacy FEP Data Capabilities**

-NETWORK COMMUNICATIONS

- Uses Industry Standard RPC Libraries BSD Ver 4.3**
- Utilizes Client/Server Paradigm**
- Utilizes Microwares Stacked Protocol File Manager (SPF)**

RAMP METERING ALGORITHM

- San Diego Ramp Metering (SDRMS)**
- Stubs for Industry Metering**



-DISTRIBUTED PROGRAM

- Client/Server Design using TCP/IP**

-MODULAR DESIGN

- Multi-Process Program**

- Each Process is stand Alone Capable**

- Each Program has Built-in Debugging**

- Module Selectable Configuration File**

- Modules Included:**

**Surveillance, Front Panel, Metering, Field I/O,
SDRMS, SATMS, Network**



-URMS OPERATIONAL REQUIREMENTS

- Designed Around Operational Requirements**

-URMS API

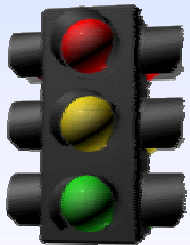
- Implements an API Utilizing Standard RPC Definitions**

- Interfaces without URMS Code changes**



SESSION 2.4

2070's @ 2002 Winter Olympics Salt Lake City



Craig Gardner

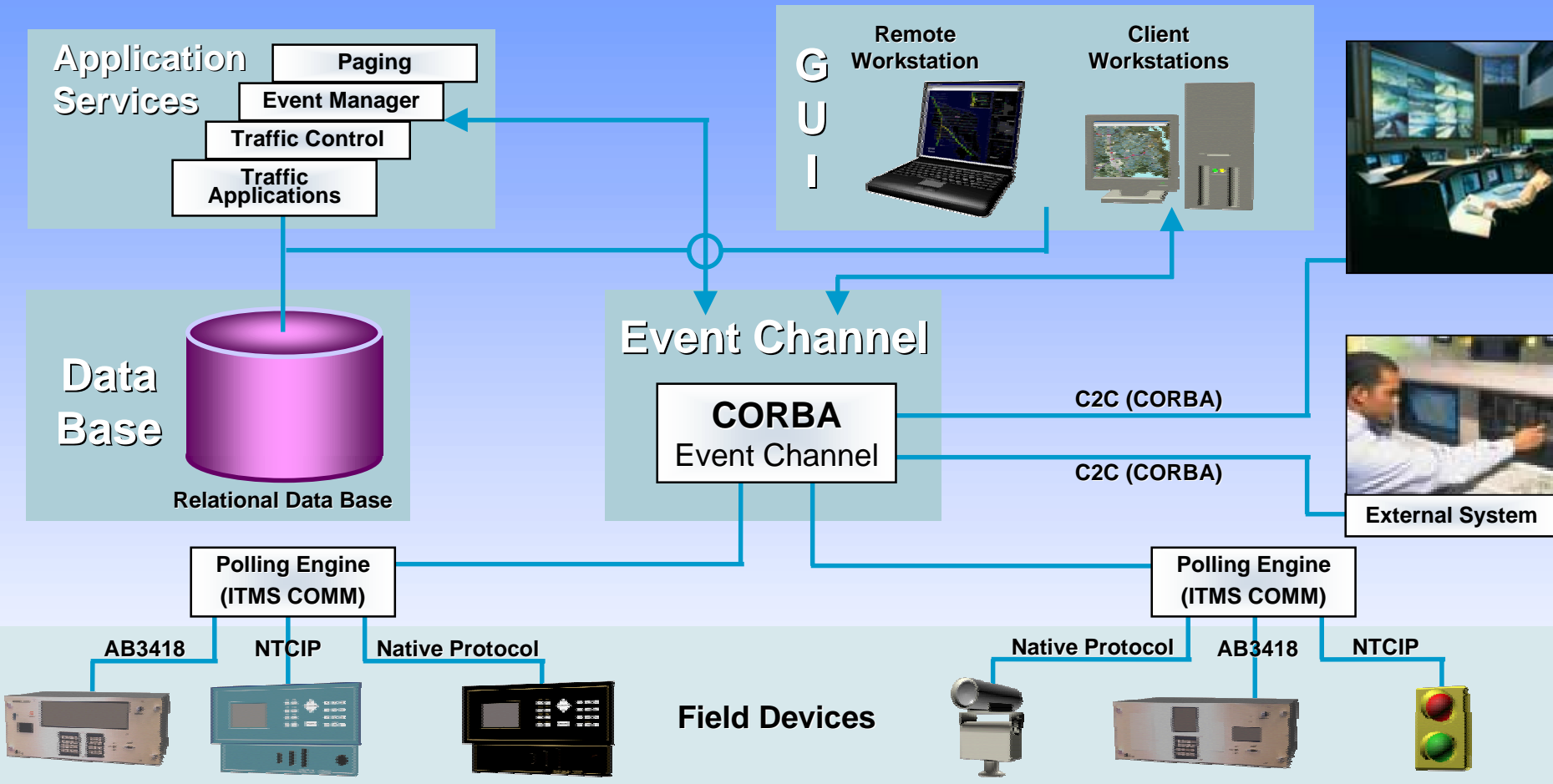


2070 & ITS CABINET WORKSHOP - AUGUST 2001

Salt Lake City ATMS

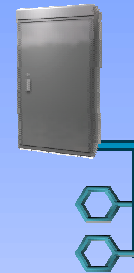


ATMS Architecture



SLC ATMS 2070 APPLICATIONS

- Freeway Surveillance
- Ramp Metering
- Light Rail Transit (LRT) Signal Priority



Freeway Surveillance

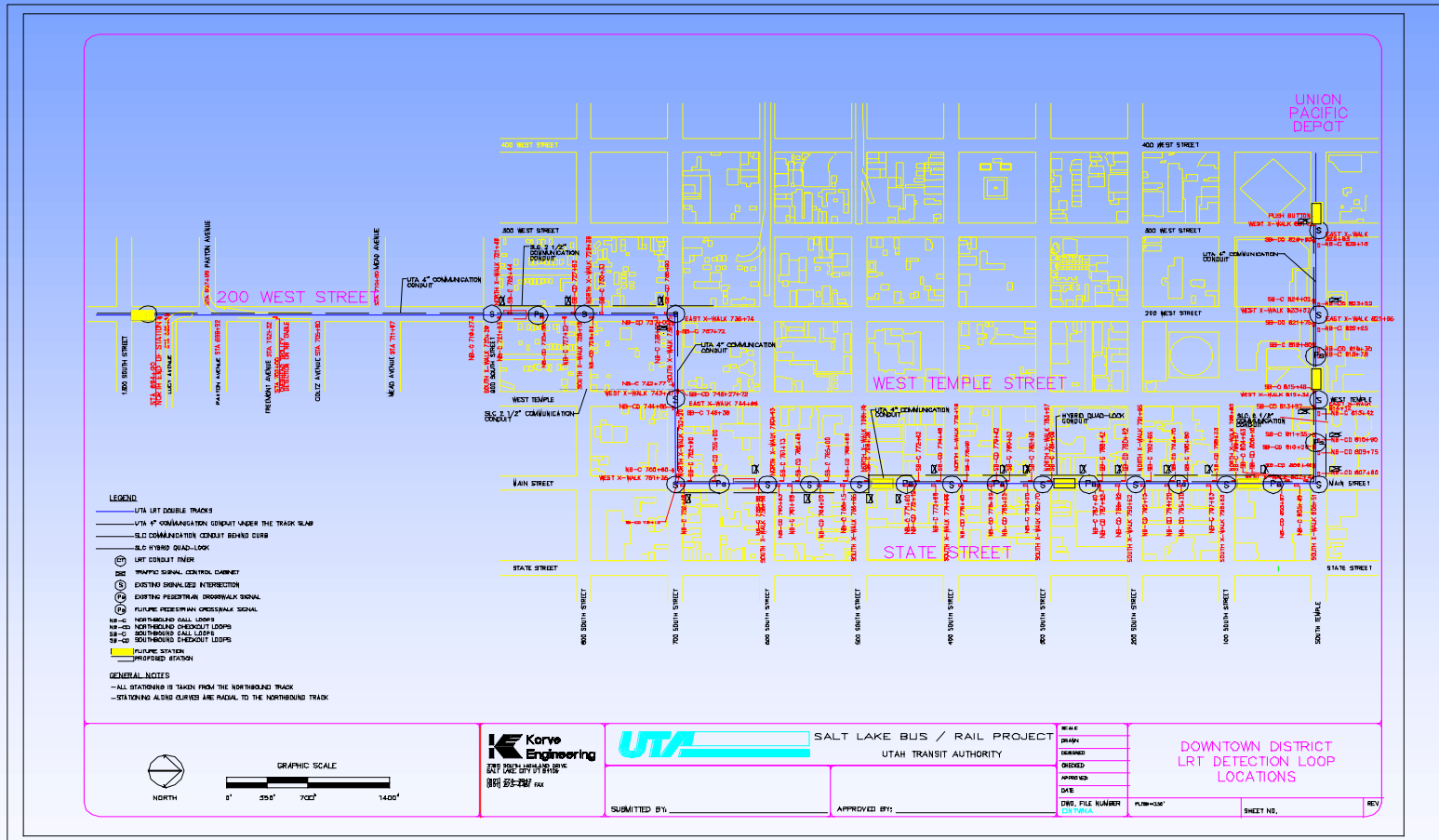
- **Approx. 250 Mainline Stations**
- **Lanes Instrumented w/ Inductive Loops**
- **20 or 30 second Polling by Central ATMS**
 - Lane Volumes, Occupancies & Avg. Speeds
- **Data Bin Processing**
 - Speed Distributions
 - Vehicle Length Distributions
 - 5 min to 24 hr periods

RAMP METERING

- . Approx. 25 Currently Active Meters
- . Traffic Responsive, TOD, or Central Algorithm Rate Selection
- . NTCIP Compliance (Objects & Comm.)



SLC LRT Signal Priority



1300 South Station



700 S & 200 W – Around the Corner



Main St.



LRT ATMS Requirements

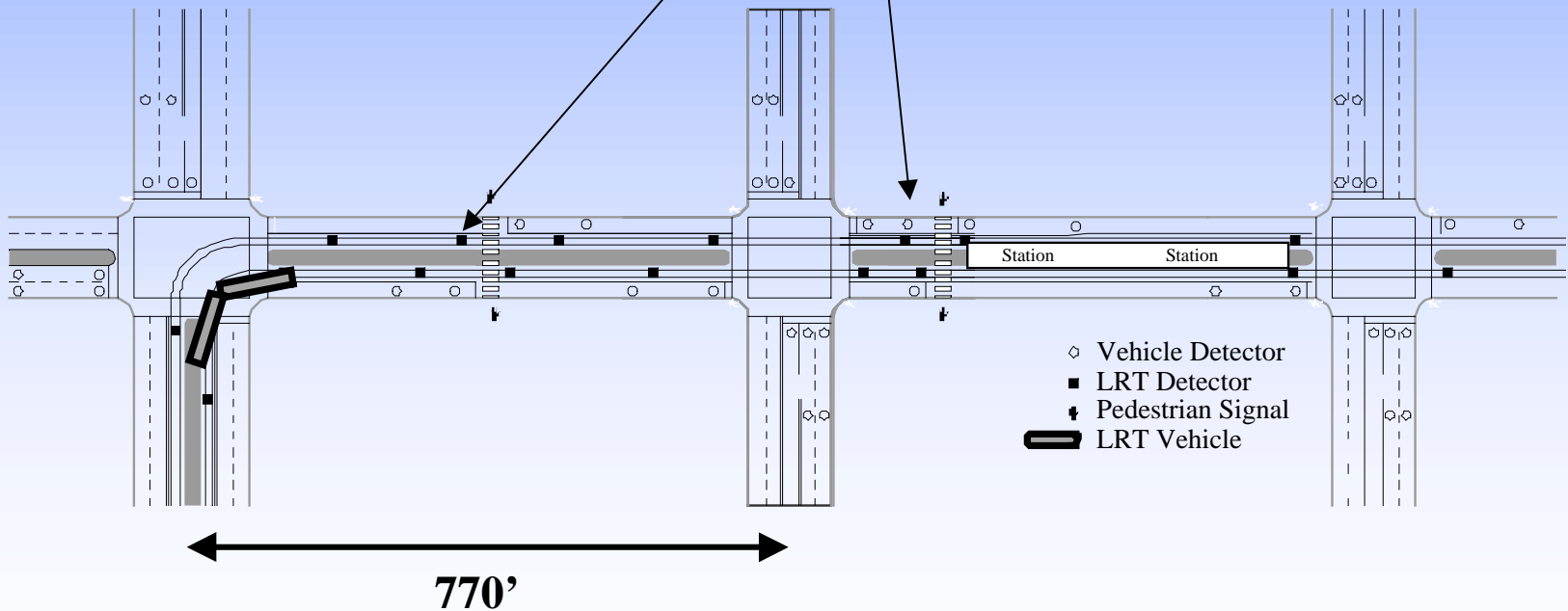
- **LRT progression along route (both directions)**
- **Maintain coordinated signal operations**
- **Provide LRT queue jump at start of phase**
- **LRT Signals - flash GO for clearance (6 flash + 3 RED)**
- **Provide “greenband” countdown timers at end-stations**
- **Operate as an integrated component of ATMS**
- **Utilize agency standard cabinets/equipment**

LRT ATMS Design Challenge

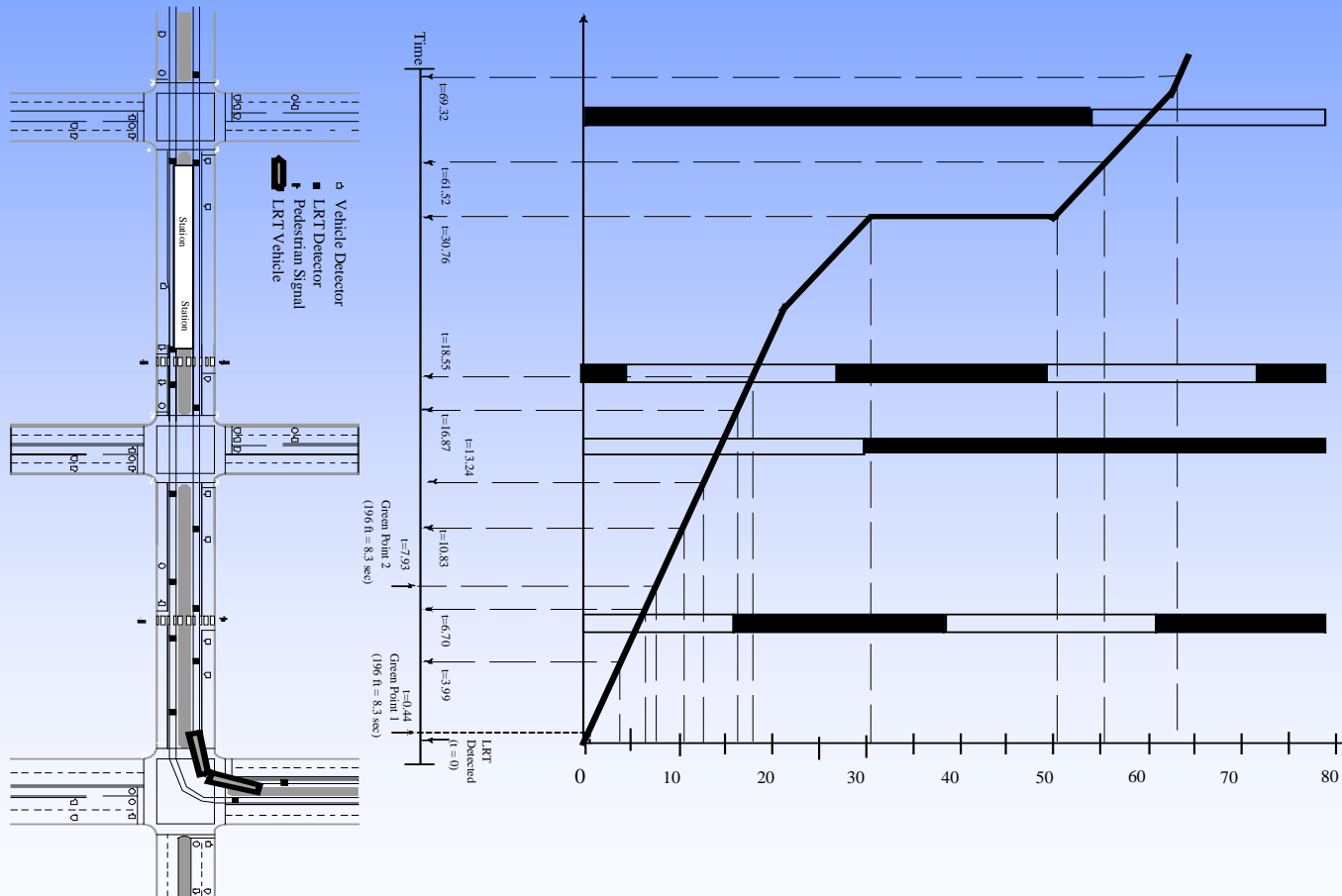


25mph LRT
vehicle

Signalized
Ped Crossings



Integrating with Signal Control



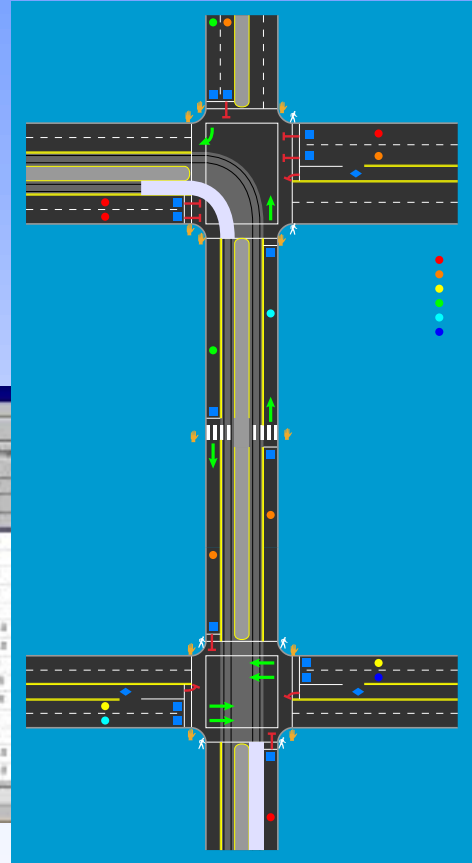
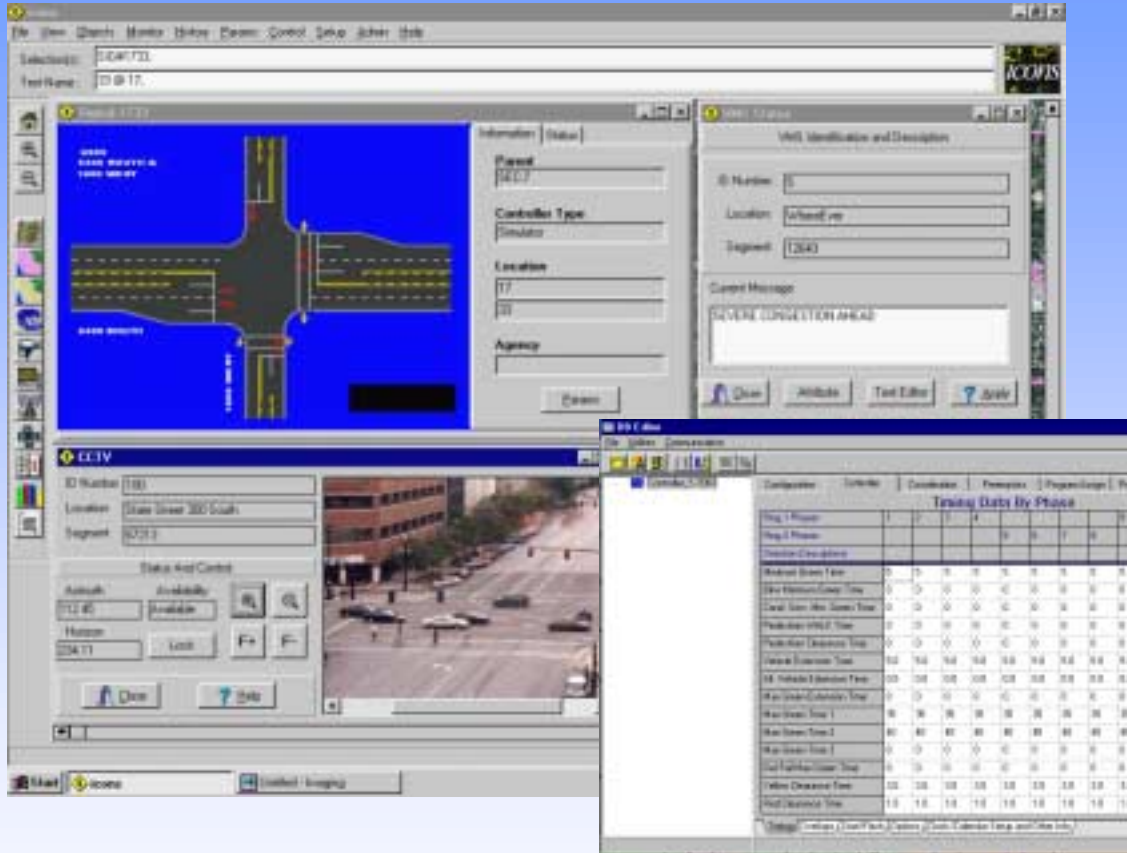
LRT ATMS Design Issues

- **Need prediction to prepare signal before train arrives at “Green Point”**
- **Need controller logic that can provide LRT service within coordinated signal timing**
- **Integrate into UDOT/SLC ATMS**

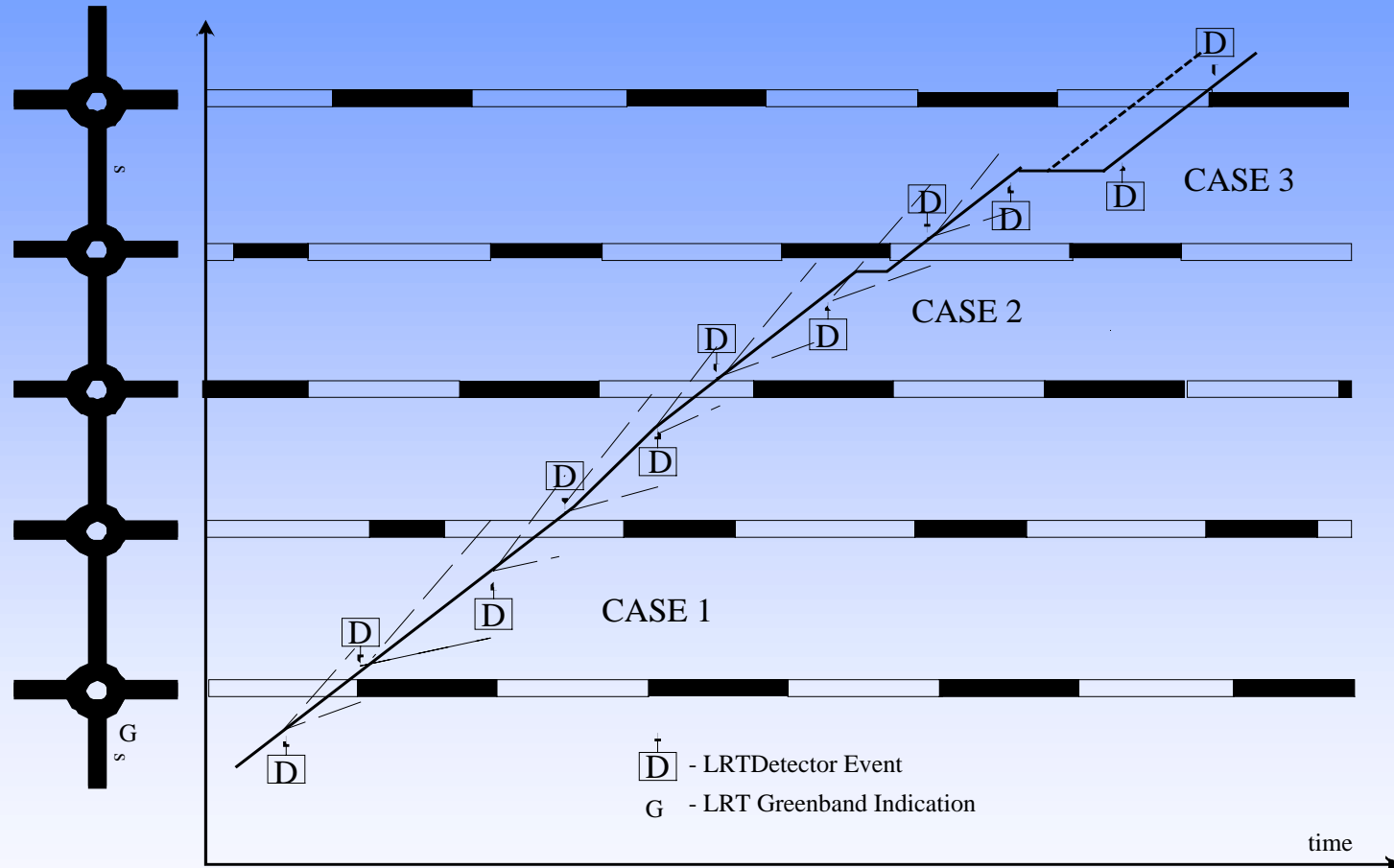
LRT ATMS Design Approach

- **Central ATMS Enhancements**
 - Operator Decision Support
 - Operations Monitoring
 - Controller Programming
 - LRT Priority Service
 - Prediction of LRV Position
 - Detector Fault Monitoring
- **Intersection Controller Enhancements**
 - Priority Timing
 - Progression
 - Coordination
 - Queue Jump
 - Existing TS-2 Cabinets
 - New 2070 ATC Controllers

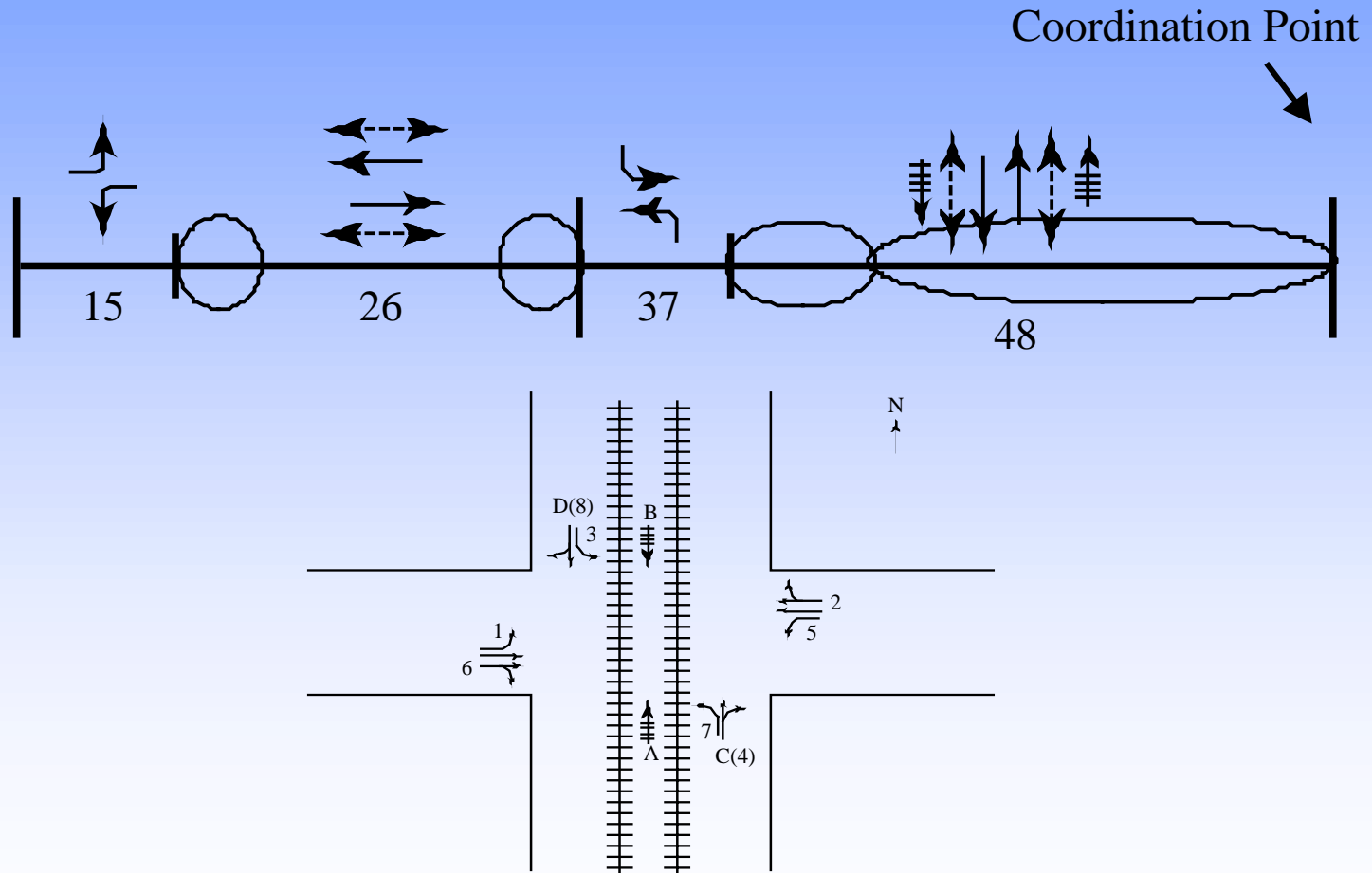
ATMS Workstation



LRT Path Prediction (LRT Priority Service)



Signal Timing - LRT Service Opportunities



LRT Results

- **Developed an integrated system to provide traffic signal priority for LRT operations in downtown Salt Lake City**
- **Priority provided within coordinated signal operations**
- **LRT operations began revenue service on December 6, 1999**

SESSION 2.5

NextPhase

Intersection Management Software

Craig Gardner



2070 & ITS CABINET WORKSHOP - AUGUST 2001

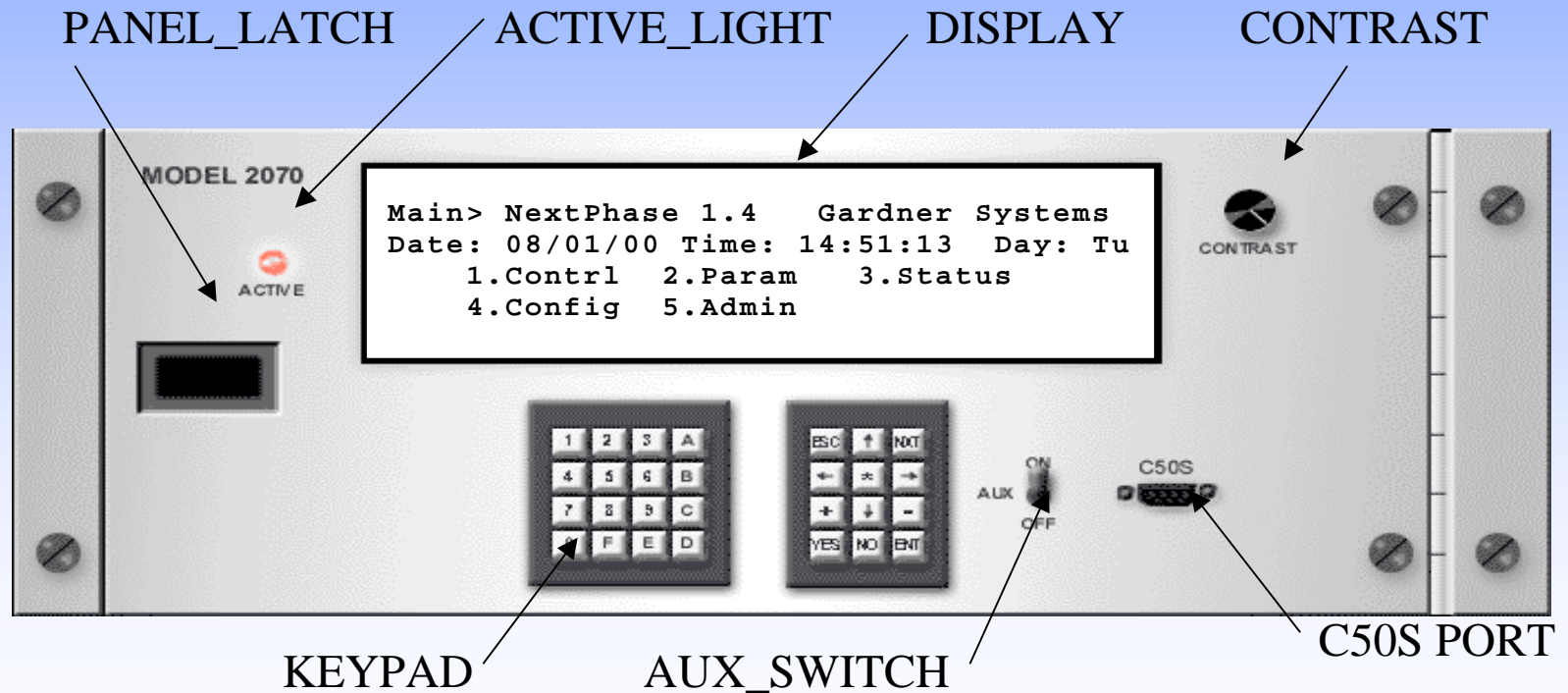
2070 Hardware Features

- **Model 2070 Hardware**
 - 32-Bit Processor with Real-Time Operating System
 - 4 or 8-Line by 40 Character Display Grid
 - Up to 4 External Communications Ports Available
 - Supports Multiple Cabinets -> 170, TS1, TS2, ITS
 - Modular Design Allows Different Configurations
 - Chassis, Power Supply, VME Expansion Cage, CPU Board, Front Panel, Field I/O & Communications Modules



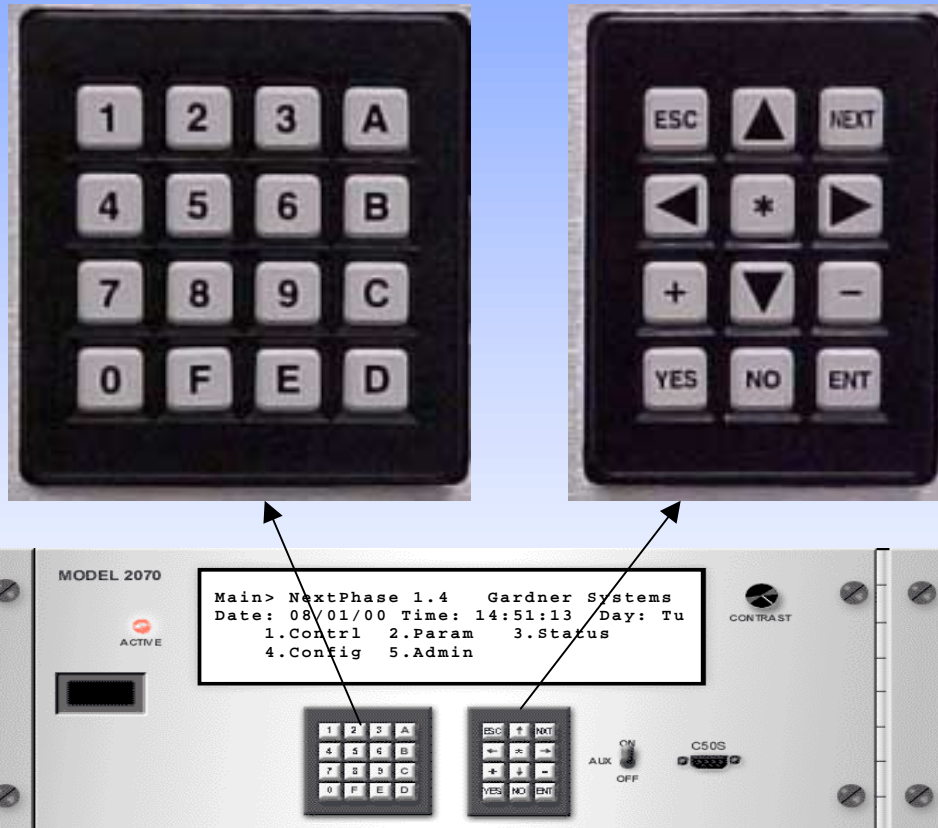
2070 Controls

- **The Model 2070 Controller Front Panel**



2070 Controls

The Model 2070 Controller Keypads



NextPhase Overview

- **Designed for ATC's such as the Model 2070**
- **C++ Reliability and Expansion (Source Avail.)**
- **Easy to use, Menu-Driven Interface**
- **Advanced Communications (NTCIP)**
- **Cooperate Multitasking (standard API)**
- **Extendable Features such as Adaptive Control or Transit Priority**



Capabilities of *NextPhase*

- **Standard Software Capabilities**
 - 40 Phases / 20 Overlaps
 - 20 Rings / 26 Barriers
 - Rings can Operate Independently or in Groups
 - Overlaps Configurable like Phases
 - Minimum Green
 - Actuated / Extension
 - Pedestrian Timings
 - 64 Vehicle / Pedestrian Detectors
 - Smart Menu System (shows configured only)
 - Standard Configuration Templates



Capabilities of *NextPhase*

- **Optional Software**
 - Traffic Adaptive Control (RHODES)
 - NTCIP Communications (ASC Objects)
 - CMS Control (NTCIP Translator)
 - CCTV (NTCIP Translator)
 - Ramp Metering
 - Reversible Lane & Gate Control



Capabilities of *NextPhase*

- **System Coordination**
 - **250 Coordination Plans Supported**
 - Coordinated, Adaptive, Free, Programmed Flash
 - Multiple Offset Values & Reference Points Available
 - **Multiple Transitioning Modes**
 - Hold, Dwell, Long Way, Short Way, Best Way
 - Minimum & Maximum Split Timings per Plan
 - **Internal and/or External Coordination Control**
 - Various Plan Selection Modes Available
 - Manual, TOD Schedules, or Remote Commands



Capabilities of *NextPhase*

- **User Interface**
 - Menu Driven Displays
 - Config. Based Data Filtering
 - Login and Passwords (Optional)
 - Multiple Access Levels
 - Automatic Logout Configurable
 - Configurable Preferences
 - Backlight
 - Key Repeat & Scrolling
 - Shortcut Keys for Bitfield Data (Flags)



Capabilities of *NextPhase*

- **Support of Multiple Cabinet Types**
 - Model 170
 - NEMA Controllers
 - NEMA TS1
 - NEMA TS2 - Type 1
 - Fully Configurable
 - 128 Input Channels
 - 128 Output Channels



Capabilities of *NextPhase*

- **External Communications**
 - Multiple Ports Configurable
 - Extended AB-3418 Protocol Support
 - NTCIP Comm. (Optional)
 - Wireless – Event Driven
 - Remote PC-Based Graphical Database Editor (Upload / Download Capabilities)
 - “NextWeb” Palm Device Interface



Capabilities of *NextPhase*

- ***NextPhase* Database**
 - Multiple Tables
 - 250 Plan-Related Data Tables
 - 10 Instances Supported for most Configuration Tables
 - Fail-Safe Checks and Back-ups
 - Automatic File Integrity Checks
 - Parameter Tables can be Backed-up or Restored
 - Corrupted Tables Automatically Restored from Backup
 - Changeable Range Limits (Yellow Clearance, Etc)



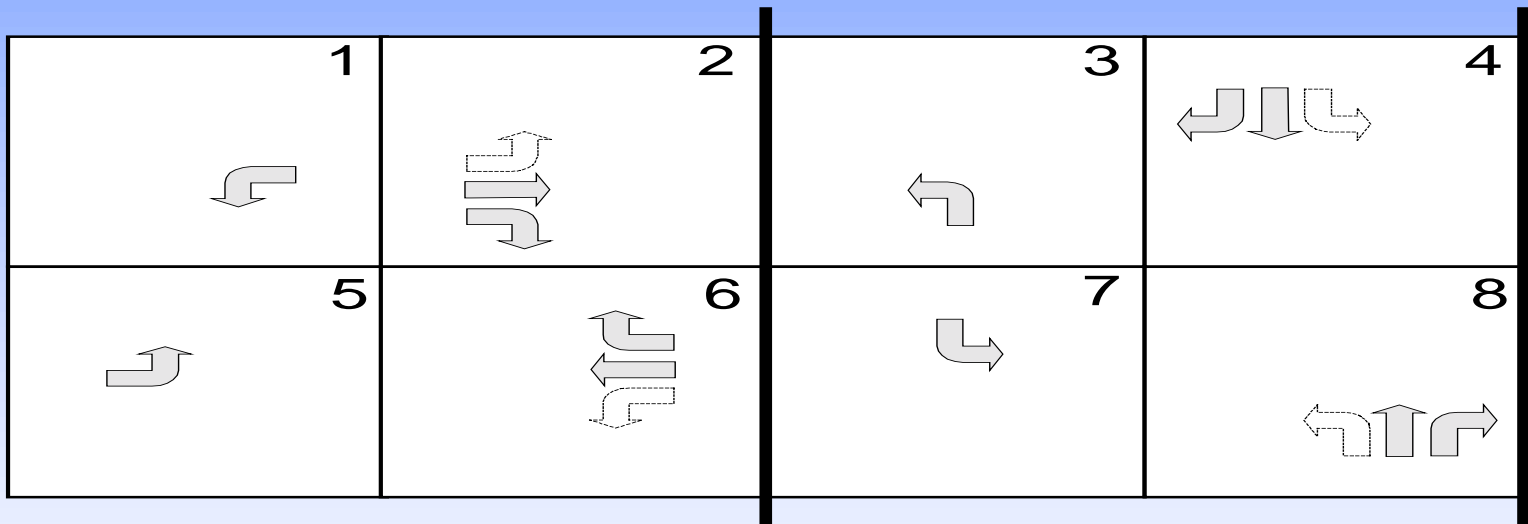
The Menu Structure

- **The Main Menu**
 - Submenu Options
 - Control [Control] -> Modify the Active Control Settings
 - Parameters [Param] -> Typical Day-to-Day Operations
 - Status [Status] -> Monitor Active Status Information
 - Configuration [Config] -> Initialization Information
 - Administration [Admin] -> Access and Interfacing



Ring Phase Configuration

- Phase Rings Submenu (Dual-Ring Structure)



```
PhsCfg 1> Ring Configuration
R1  1,2,a,3,4,b
R2  5,6,a,7,8,b
R3
```


“RHODES” Adaptive Control

- **Adaptive Control Status**
 - Status Display
 - Plan [Plan] -> Indicates the Active *NextPhase* Plan
 - Mode [Mode] -> Shows the Requested Operating Mode
 - State [State] -> Shows Current Adaptive Operating Mode
 - Control Ready [OnLineRdy] -> Seconds Before On-Line
 - Peer Fail [PeerFail] -> Shows the Peer Message Status
 - Blank () -> Not Configured
 - Dot (.) -> Peer Message Good
 - Bad (X) -> Peer Message Failure
 - Optional Feature Available in *NextPhase*



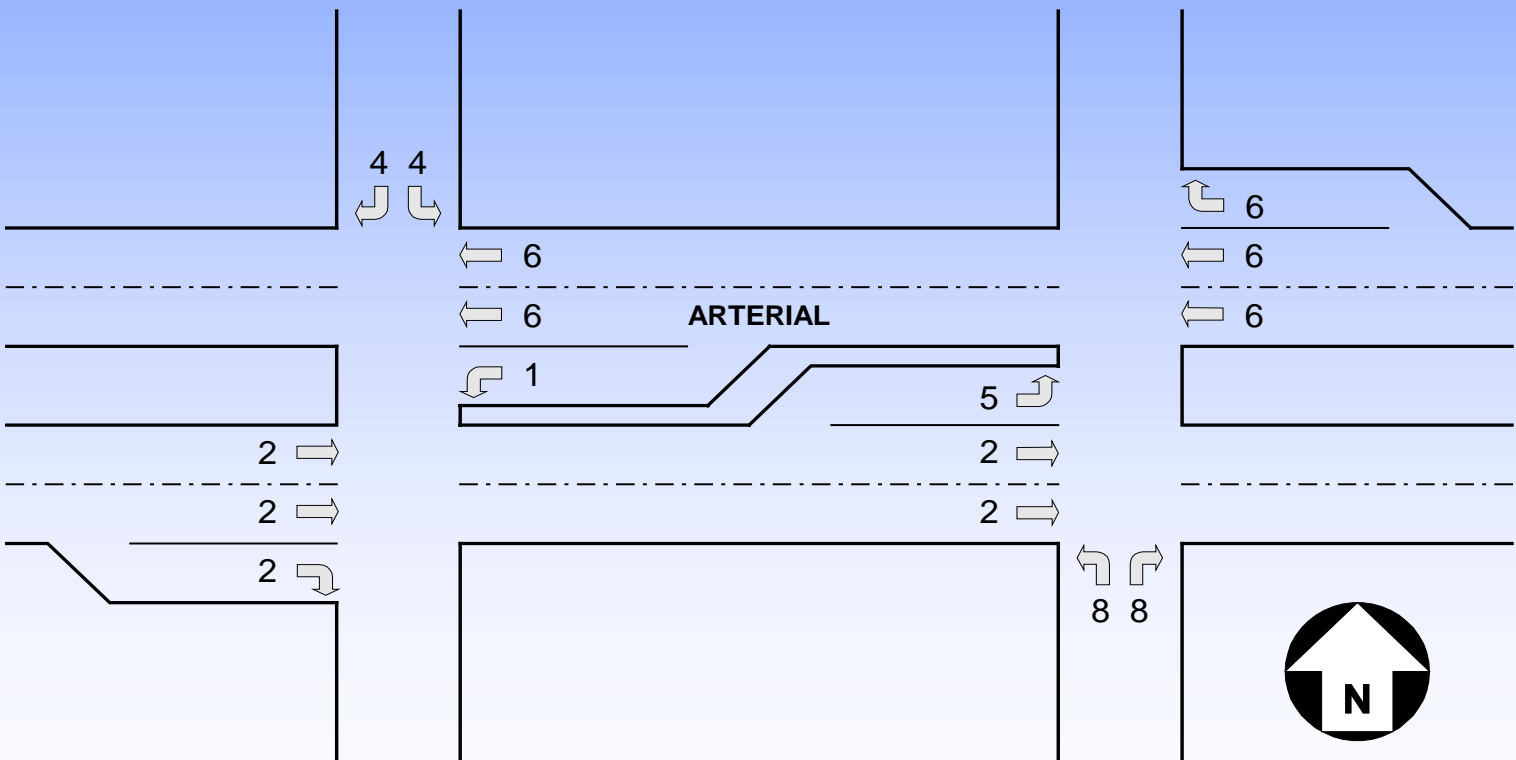
Adaptive Queue

- **Adaptive Queue Status**
 - Status Display Definitions
 - Screen Displays all the Queue Estimates used by the Optional Adaptive Control Module
 - Each Heading Represents a Specific Traffic Movement and the Associated Queue Length



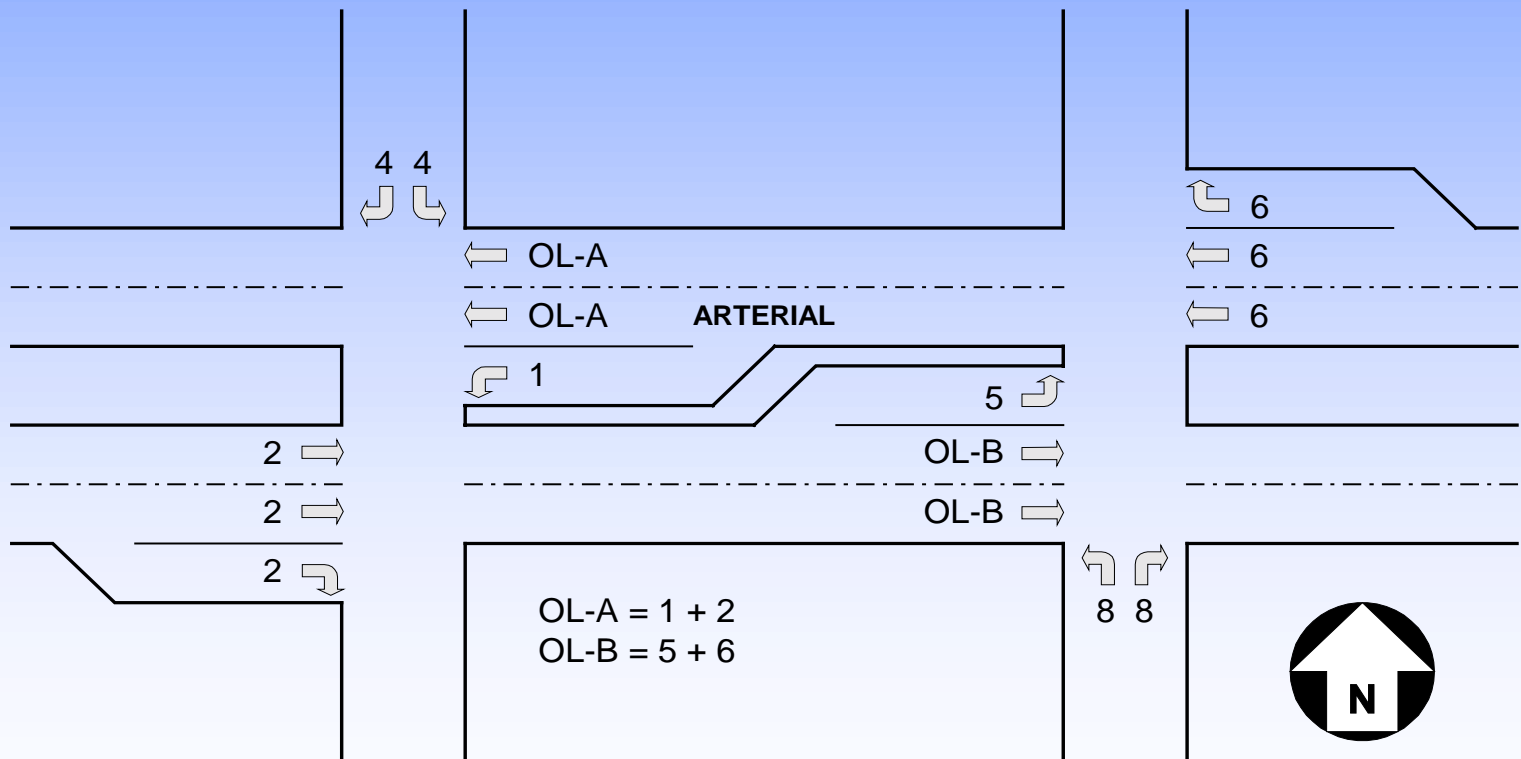
Examples / Diamonds

- Diamond Interchange (Separate 3-Phase)**



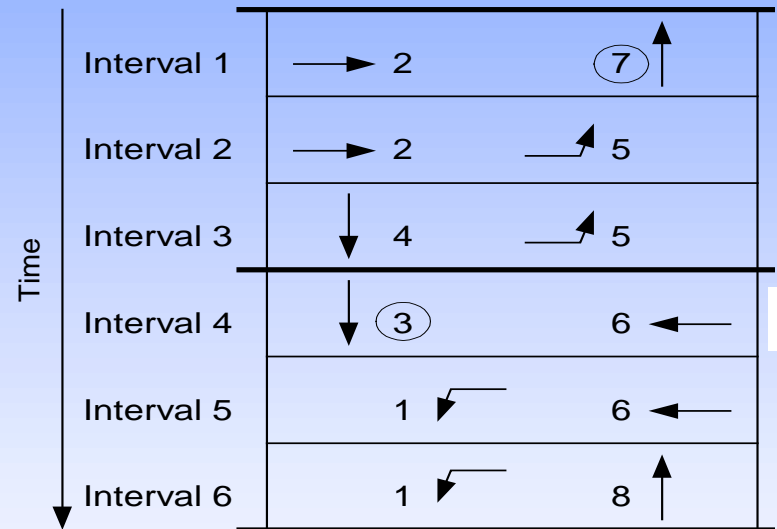
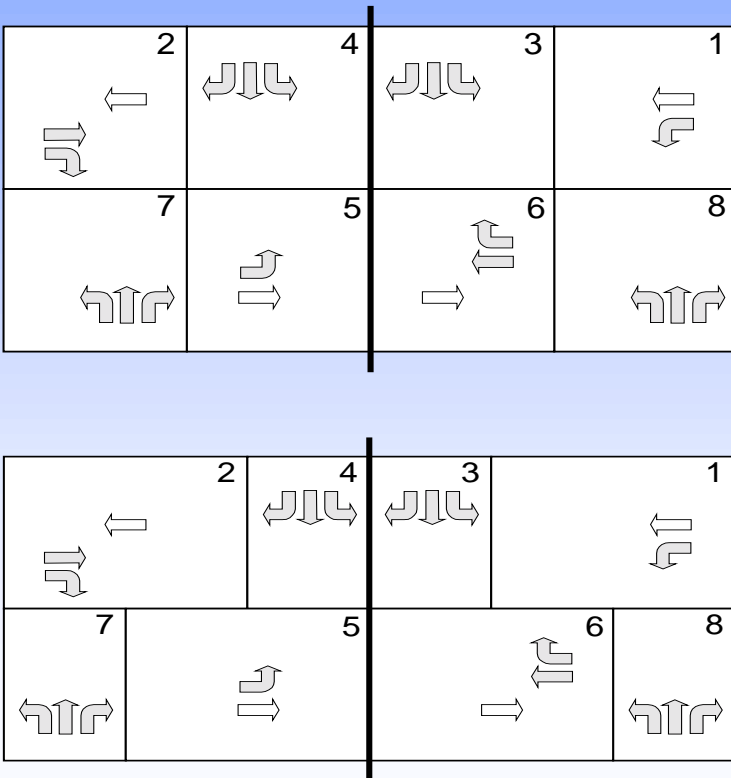
Examples / Diamonds

- Diamond Interchange (Single 3-Phase)**



Examples / Diamonds (Rings)

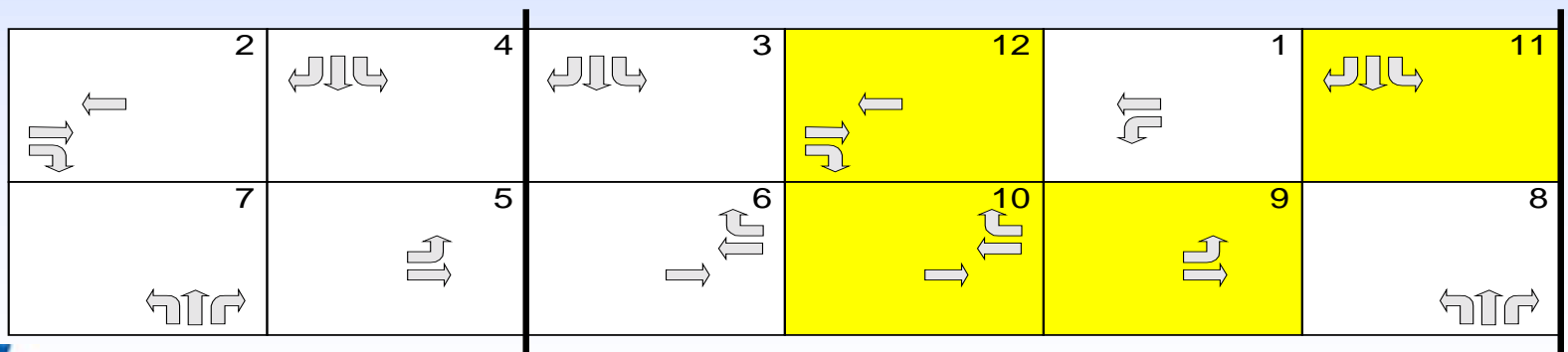
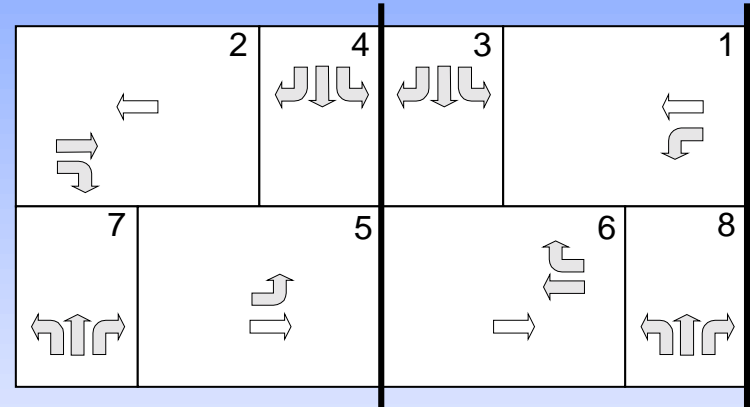
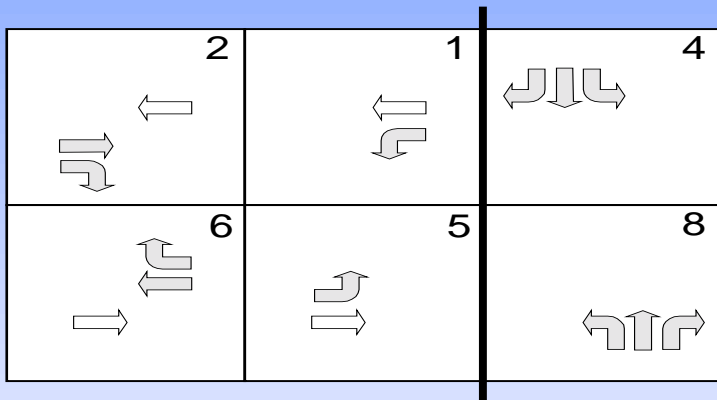
- Diamond Interchange (Single 4-Phase)**



```
PhsCfg 1> Ring Configuration
R1  2,4,a,3,1,b
R2  7,5,a,6,8,b
R3
```

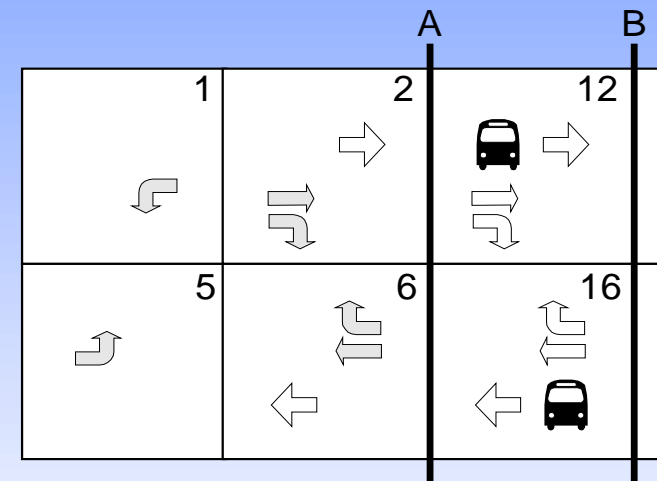
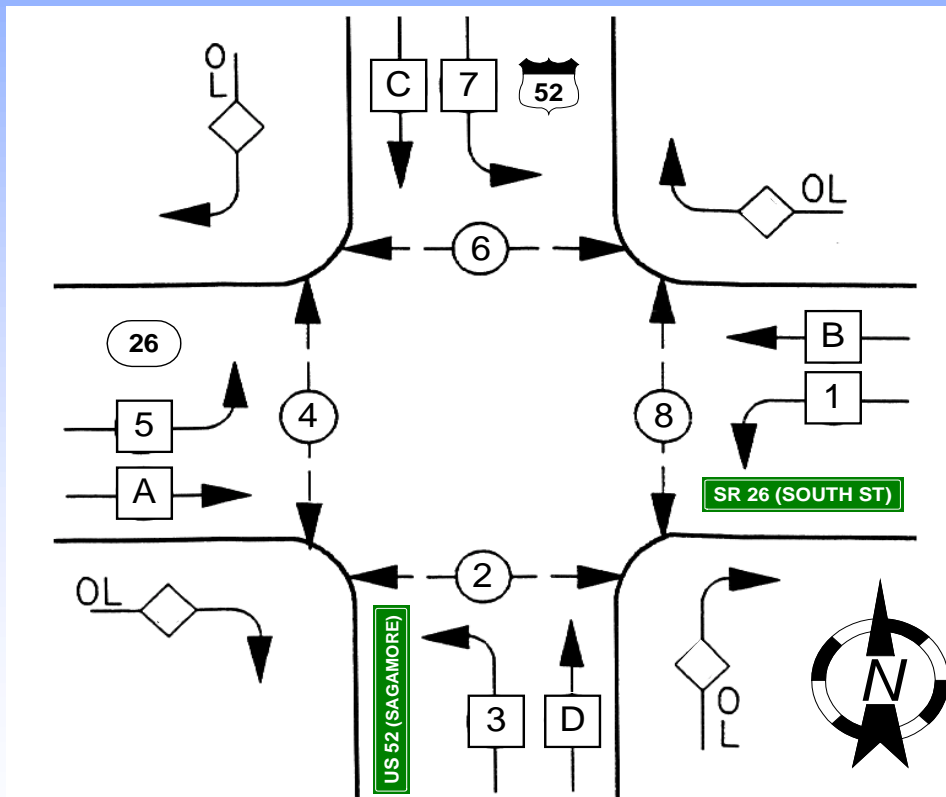
Examples / Diamonds (Rings)

- The Power of *NextPhase* (3 & 4-Phase)



Examples / Bus Priority

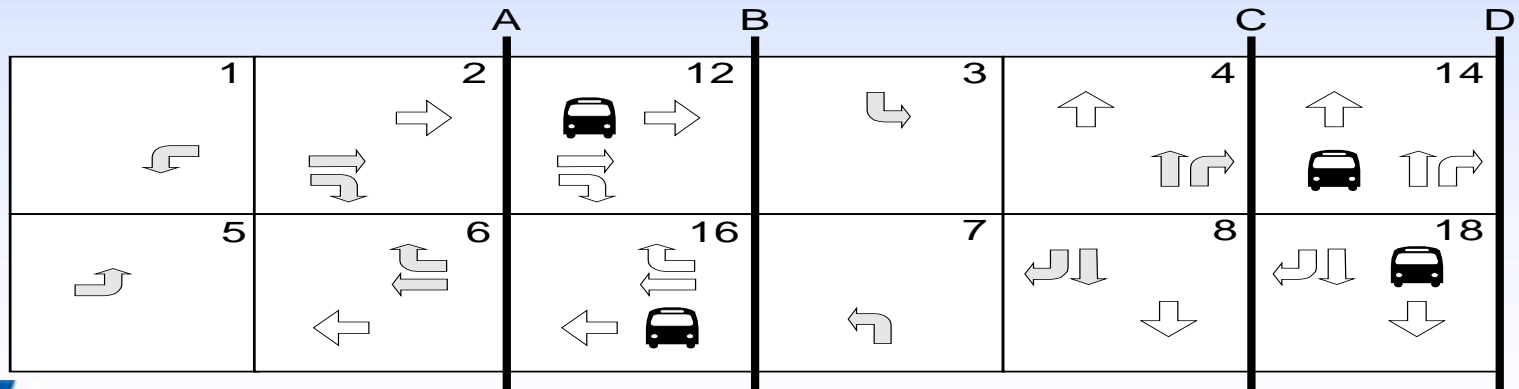
- Bus Priority Demonstration (With Priority)**



PhsCfg 1> Ring Configuration
 R1 1,2,a,12,b,3,4,c,14,d
 R2 5,6,a,16,b,7,8,c,18,d
 R3 22,26,32

Examples / Bus Priority

- **Control of Slack Time Allocation after Hold Phases – Maximum Green While Coordinated**
 - Typically used when Phases are Omitted Periodically
 - Both Bus and Transit Priority are Practical Examples
 - Particularly Helpful for Fixed-Time Operation (Max Recall)



Bus & LRT Transit Priority

- Any number of transit movements
- Early green, extended green, inserted green
- Multiple opportunities in cycle when needed
- Any number of advance detectors
- Delay any action after detection
- Queue jump phases if needed
- No offset transitions – stays in step
- Lock out period after priority if desired
- Free, coordinated, phase sequence by TOD
- LRT reverse running if needed
- Activate “Trolley Coming” signs



Overview of Overlaps

- ***NextPhase* Overlap Functionality**
 - Overlaps Operative Similar to Phases
 - Contains Minimum and Maximum Green Times
 - Has its own Red, Yellow, and Green Clearance Times
 - Compatible Pedestrian Timing with Some Overlap Types
 - Other Advanced Overlap Features
 - Ability to Terminate Overlaps (with Input) just as Phases
 - An Optional Reservice Timer that Control Reservice Time
 - Option of using Phase Clearances or Overlap Clearances



NextPhase Summary

- **Smart User Interface**
- **40 phases**
- **20 rings**
- **26 barriers**
- **20 overlaps**
- **10 preempts**
- **Mapped I/O**
- **250 plans**



- **Simple Setup w/ Templates**
- **Ped overlaps**
- **Multiple signals**
- **“Free” coordination**
- **Repeated phases**
- **Unequal double cycling**
- **Transit Priority**
- **Complex Intersections**

SESSION 2.5

2070 and RELATED SOFTWARE PRODUCTS NAZTEC, INC.

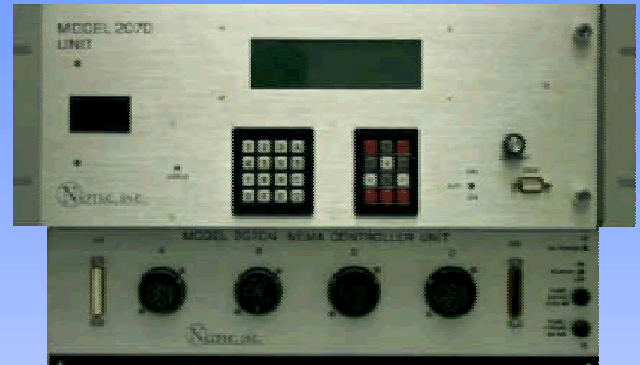
- INTERSECTION SIGNAL CONTROL
- STREETWISE ATMS
- PALM PILOT™ INTERFACE
- 2070 TEST BOX and SIMTRAFFIC™
 - SUITCASE TESTER
 - HARDWARE-IN-THE-LOOP SIMULATION

CLYDE NEEL



2070/NTCIP CONTROLLER FEATURES

- 16 PHASES / 16 OVERLAPS / 4 RINGS
- NTCIP OVER ETHERNET AND SERIAL
- DYNAMIC (VARIABLE) MAX TIMES
- TWICE-PER-CYCLE LEFT TURNS
- OVERLAP DISABLE BY PLAN
- SUPPRESS OVERLAPS BY PHASE OR OVERLAP
- VOLUME AND OCCUPANCY-ON-GREEN MOE's
- NTCIP & ENHANCED COORDINATION MODES (FIXED/FLOATING FORCE OFFS)
- CIC ADAPTIVE SPLIT ALGORITHM PROVIDES ENHANCED TRAFFIC RESPONSIVE, OR ADAPTIVE LEVEL CONTROL
- RECOVER COORDINATION WHEN PED CALLS OVERRUN THE SPLIT FORCE OFF
- COME OUT OF PREEMPTION IN COORDINATION
- 10 DEFINABLE PREEMPTION CHANNELS



STREETWISE ATMS: MOST POPULAR TOOLS

- **PALM PILOT™ UPLOAD/DOWNLOAD TO CONTROLLER**
- **PAGER AND E-MAIL NOTIFICATION OF SELECTED ALARMS**
- **REAL-TIME SPLIT MONITORING & TIME-SPACE DIAGRAMS**
- **Synchro™ AND SimTraffic™ TIME-SAVING INTERFACE**
- **INCIDENT MANAGER & TRAVEL ADVISORIES**
- **INTERNET/WWV/GPS TIME REFERENCE INTERFACE**
- **THIRD PARTY API FOR LOCAL AGENCY APPLICATIONS**
- **CMS AND CAMERA CONTROL**
- **MULTIPLE DETECTOR MINING GRAPHS & REPORTS**



Palm Pilot™ INTERFACE



- **UPLOAD/DOWNLOAD DATABASE TO FIELD CONTROLLERS**
- **SYNCHRONIZE REAL-TIME CLOCKS**
- **HotSync™ WITH StreetWise TO MAINTAIN LATEST DATABASE**
- **LESS TIME AND RISK IN FIELD THAN USE OF NOTEBOOK COMPUTERS**
- **EASE OF USE FOR FIELD ENGINEERS**



Naztec 2070/TS-2 and SimTraffic™ CI



- **INDIVIDUAL VEHICLE CALLS FROM SimTraffic™ EXERCISE THE DETECTOR INPUTS IN THE CONTROLLER, ALLOWING THE USER TO STUDY THE EFFECT OF TIMING PLAN STRATEGIES CLOSER TO REAL-WORLD CONDITIONS.**

SESSION 2.5

EAGLE TRAFFIC CONTROL SYSTEMS

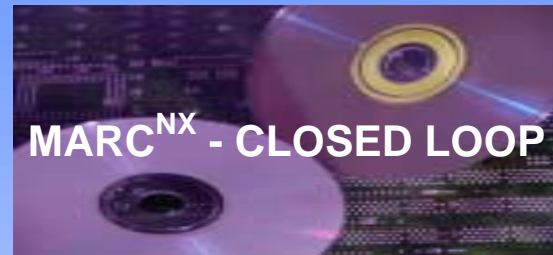


DAVE MILLER

PRODUCT LINES



FROM SIGNALS TO SYSTEMS...

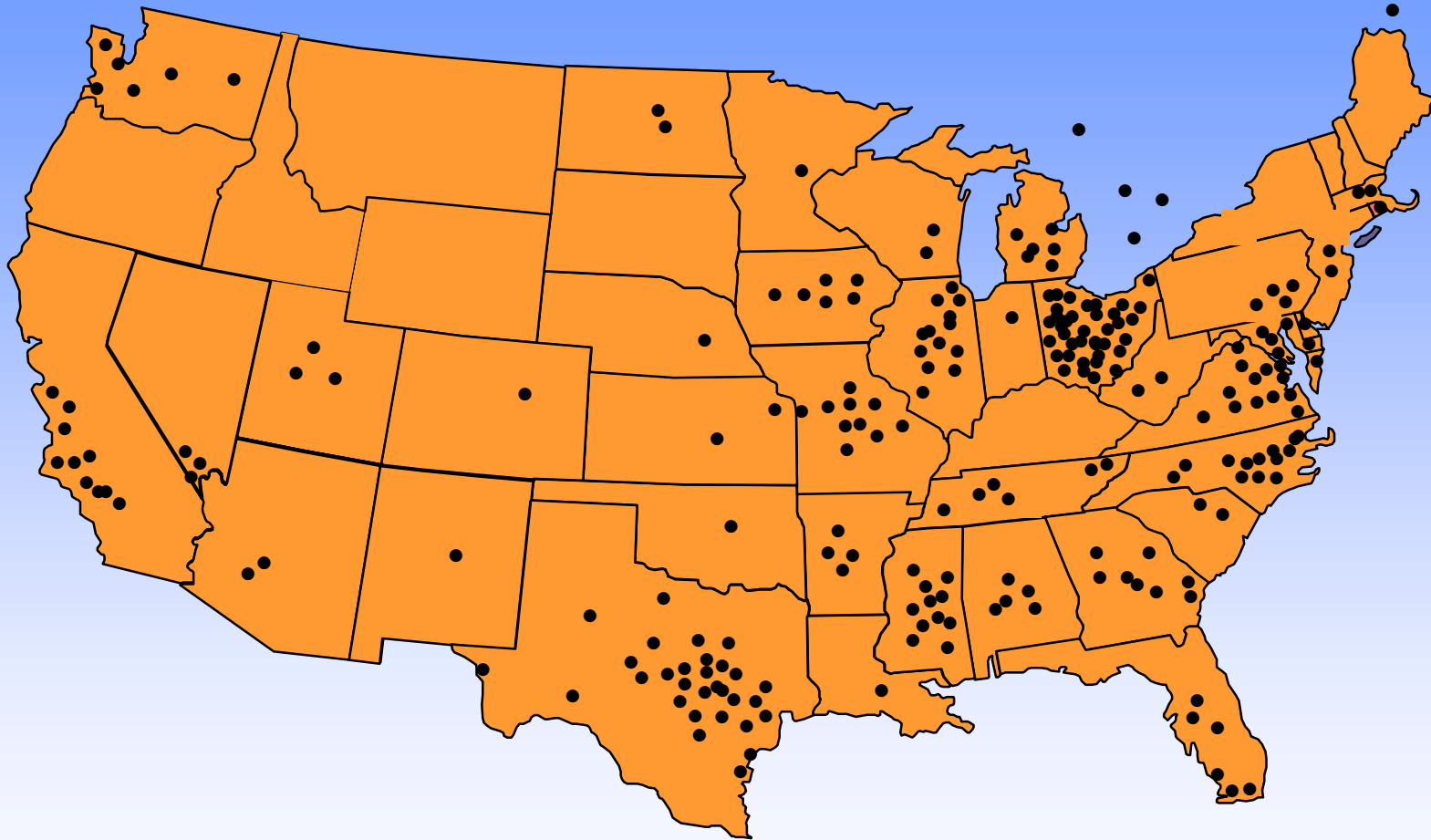


...THE SINGLE SOURCE SUPPLIER
OF TRANSPORTATION AND
PARKING PRODUCTS



2070 & ITS CABINET WORKSHOP - AUGUST 2001

SYSTEMS INSTALLED



ACTRA SYSTEM FEATURES



- A 3RD GENERATION INTELLIGENT TRANSPORTATION MANAGEMENT SYSTEM
- OFFERS THE END-USER CHOICES IN TRAFFIC CONTROL
- RUNS IN A FAMILIAR WINDOWS ENVIRONMENT
- INTEGRATES WITH SOFTWARE DEVELOPED BY OTHER SIEMENS COMPANIES
- PROVIDES OPEN ARCHITECTURE
- USES INDUSTRY STANDARD INTERFACES AND COMPONENTS
- OPEN CLIENT/SERVER ARCHITECTURE
 - FULLY SCALABLE
 - VIRTUALLY UNLIMITED EXPANDABILITY
- A TRUE ATMS/ITMS



2070 & ITS CABINET WORKSHOP - AUGUST 2001

USER INTERFACE



IntConfig Data - SOURCE : Database

File Edit View Help

Intersection Name
MARC ID/Solo Group
Phone Number (Solo Only)
Protocol
Owning Agency
Global Address

ECOM
Systems Global
0-0-0-0

Config

For Help, press F1

Report Type

Select the Intersection Report type(s):

☒ Run Reports ☐ Run & Clear Reports ☐ Clear Reports

- Communication Failures Report
- Cycle Measurements of Effectiveness Report
- Detector Failures Report
- Detector Volume Report
- EDI Monitor Fault Report
- Local Alarm Report
- Measurements of Effectiveness Report
- MMU Monitor Fault Report
- Speed Data Report
- System Detector Failures Graphic
- System Detector Failures Report

Version 0.91.00

< Back Next >

Unit Data - 6th Street & 1st Ave SOURCE : Database

File Edit View Device Help

	Channel 1	Channel 2	Channel 3	Channel 4	Channel 5	Channel 6
Flash	1-Red	2-Yel	1-Red	1-Red	1-Red	2-Yel
Alternate	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Test A = Flash	<input checked="" type="checkbox"/>					
	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Flash Entry	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Exit	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

General Control Remote Flash Overlap Ring Alt Sequence Por

elp, press F1 NUM

ACTRA

File Edit View Help

ACTRA

- Intersections
 - Add Intersection
 - Set Time - All Intersections
- Solo Groups

Intersection: 6th Street & 1st Ave

MODE: TTC

Pattern: 2130

Ph in Cycle: 45

INPUTS

Preempt:

Spec Alarm: [] [] [] [] [] [] [] [] [] []

Spec Detec: [] [] [] [] [] [] [] [] [] []

OUTPUTS

Ring: 1 2 3 4

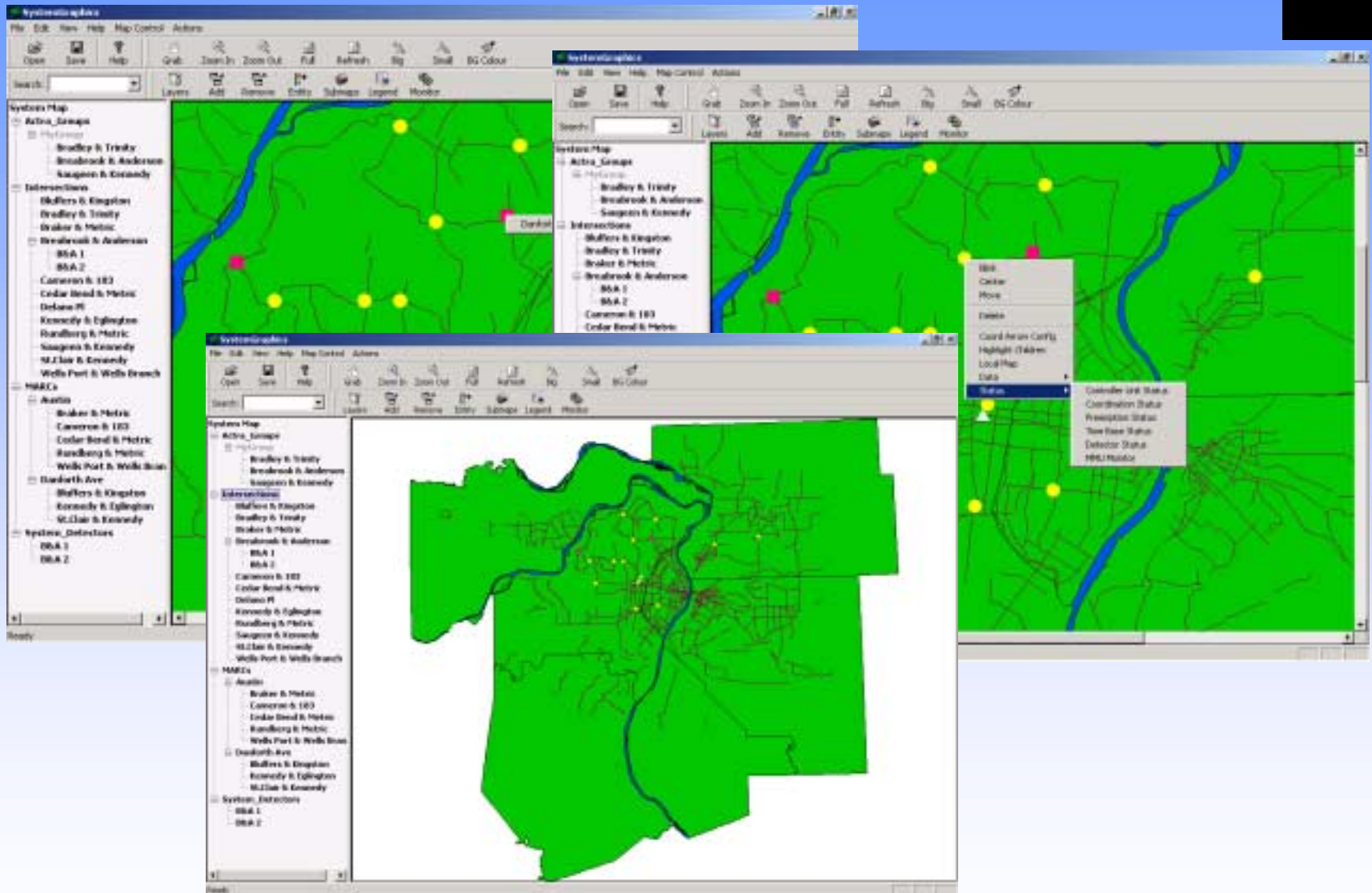
Coded Status: [001] [001] [001] [011]

Special: [] [] [] [] [] [] [] [] [] []

Arbitrary: [] [] [] [] [] [] [] [] [] []

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
STATUS:	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Loc Hold:	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Loc Detec:	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Loc Recall:	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]
Loc Recall:	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]	[]

AREA MAPS



ACTRA INTERSECTION



Intersection Map - Monroe @ Hamilton

File View Zoom Help

4:43:49

MODE: System
 Pattern: 1/1/1
 Active Phase: 2, 6
 Pt in Cycle: 0

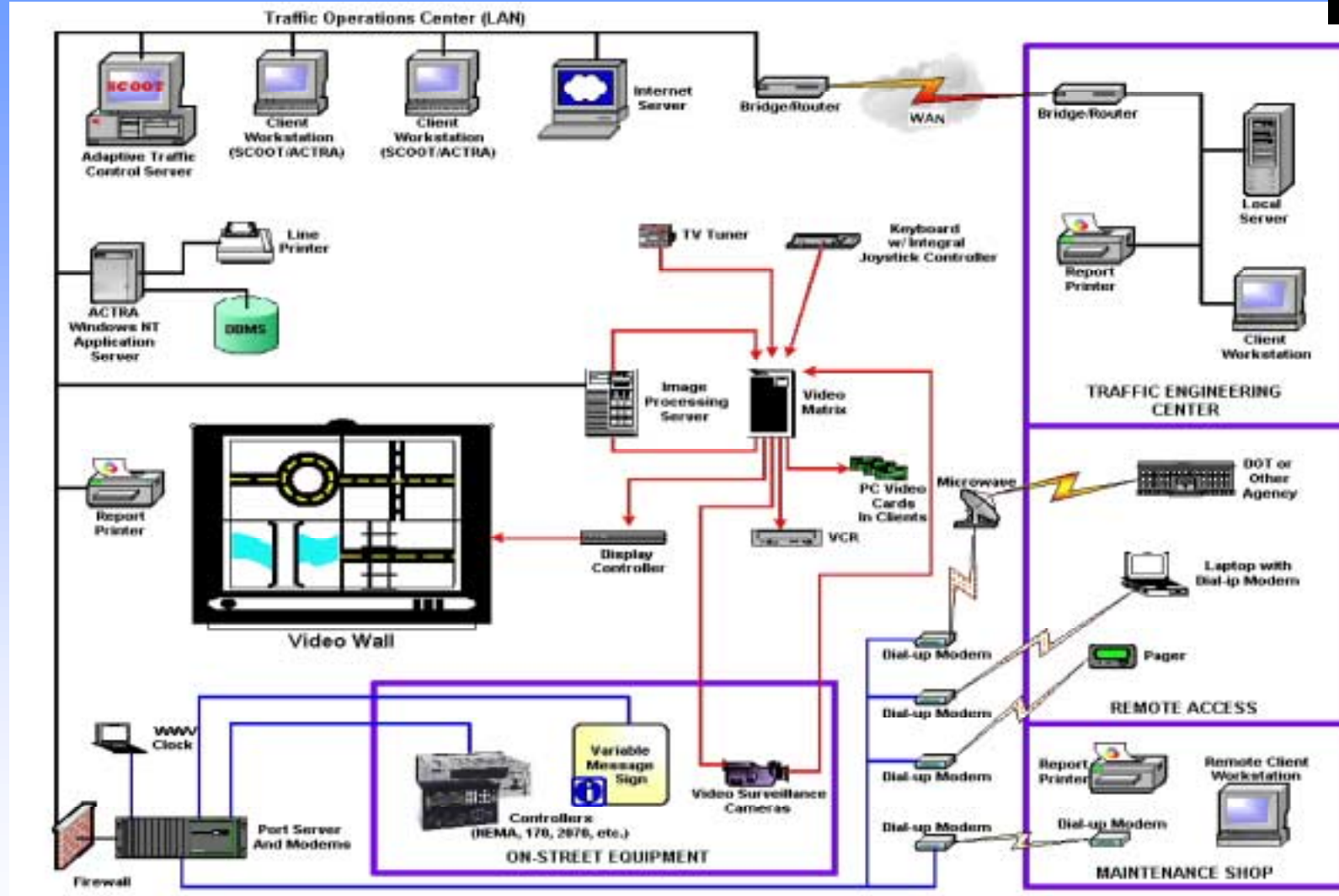
INPUTS
 Preempt:
 Spec Alarms: ☐ ☐ ☐ ☐ ☐ ☐
 SpecDets: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

OUTPUTS
 Ring: 1 2 3 4
 Coded Status: 101 100 000 011
 Special: ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
 Auxiliary: ☐ ☐ ☐

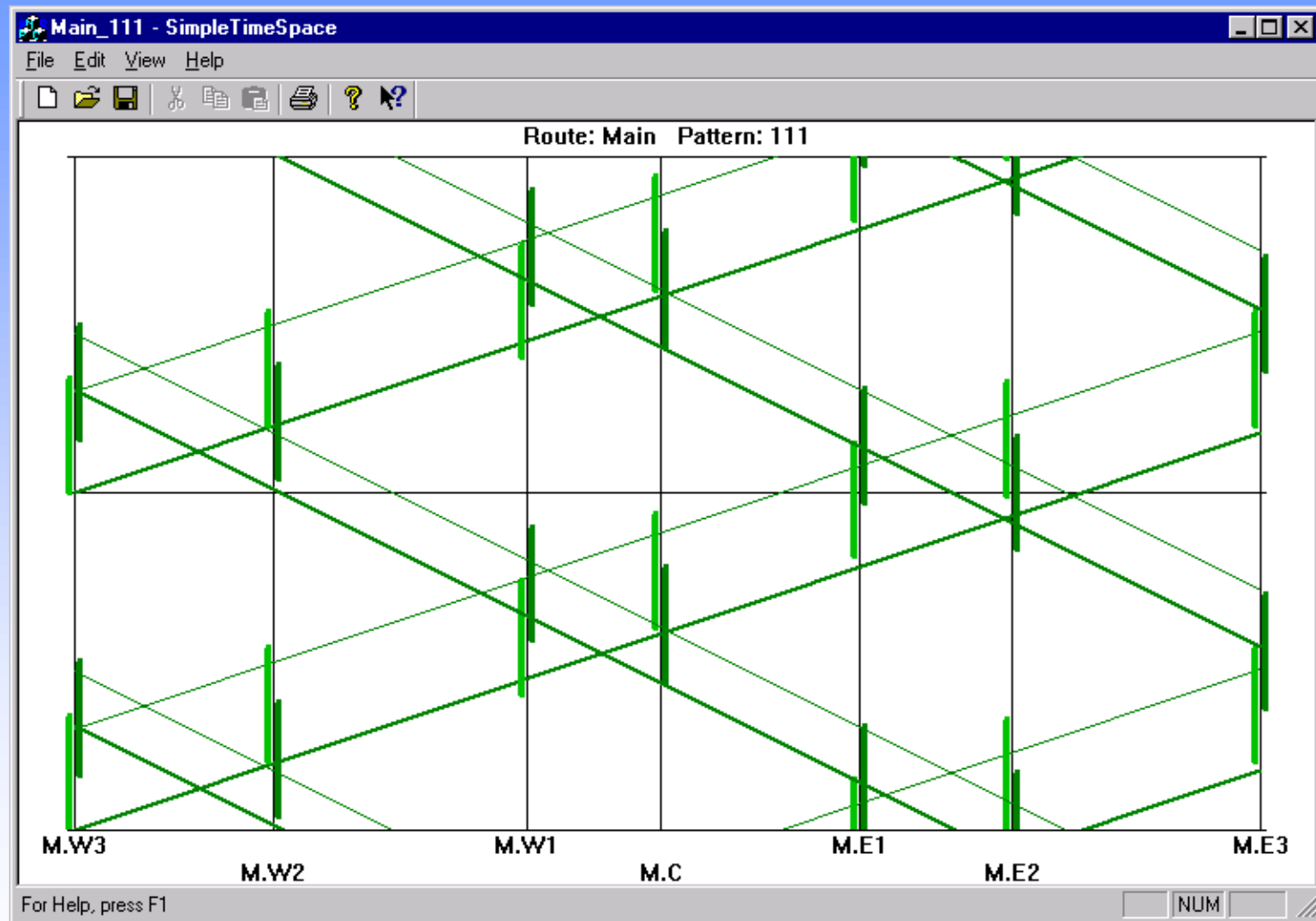
CURRENT STATUS:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Phase Holds:	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Phase Omits:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ped Omits:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vehicle Recalls:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ped Recalls:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LARGE-SIZED ACTRA SYSTEM ARCHITECTURE



TIME SPACE DIAGRAM WITH ALL REAL INTERSECTIONS



QUICK RESPONSE



Quick Response Event Manager Version 0.41 - Built Jun 8 2001 @ 09:43:16 [DEBUG_BUILD]

Status	Event Name
Active	Heavy Congress traffic
Inactive	Heavy Guadalupe traffic
Inactive	Heavy Congress/Guadalupe traffic-route
Inactive	Heavy Holiday/Nighttime/Weekend Congress traffic

Select an Event, then attach the corresponding Trigger(s) and Response(s) via a Check Box.

Check Box changing within Triggers, Activations and Deactivations is made easier by dis-allowing name editing.

Attach	Trigger Name
<input checked="" type="checkbox"/>	Congress & 1st - Heavy Traffic
<input checked="" type="checkbox"/>	Congress & 5th - Heavy Traffic
<input checked="" type="checkbox"/>	Congress & 9th - Heavy Traffic
<input type="checkbox"/>	Guadalupe & 38th - Heavy Traffic
<input type="checkbox"/>	Guadalupe & 45th - Heavy Traffic

Attach	Activation Response Name
<input checked="" type="checkbox"/>	Congress & 1st - Heavy Pattern
<input checked="" type="checkbox"/>	Congress & 5th - Heavy Pattern
<input checked="" type="checkbox"/>	Congress & 9th - Heavy Pattern
<input type="checkbox"/>	Guadalupe & 48th - Heavy Pattern
<input type="checkbox"/>	Guadalupe & 45th - Heavy Pattern
<input type="checkbox"/>	Congress - Collect Report
<input type="checkbox"/>	Cong. & Guad. - Collect Report

QUICK RESPONSE



Quick Response - Response

Time Off...	Response Action
0:07 (Hrs:...	Change a Groups Pattern
0:12 (Hrs:...	Change a Groups Pattern Again

Name:

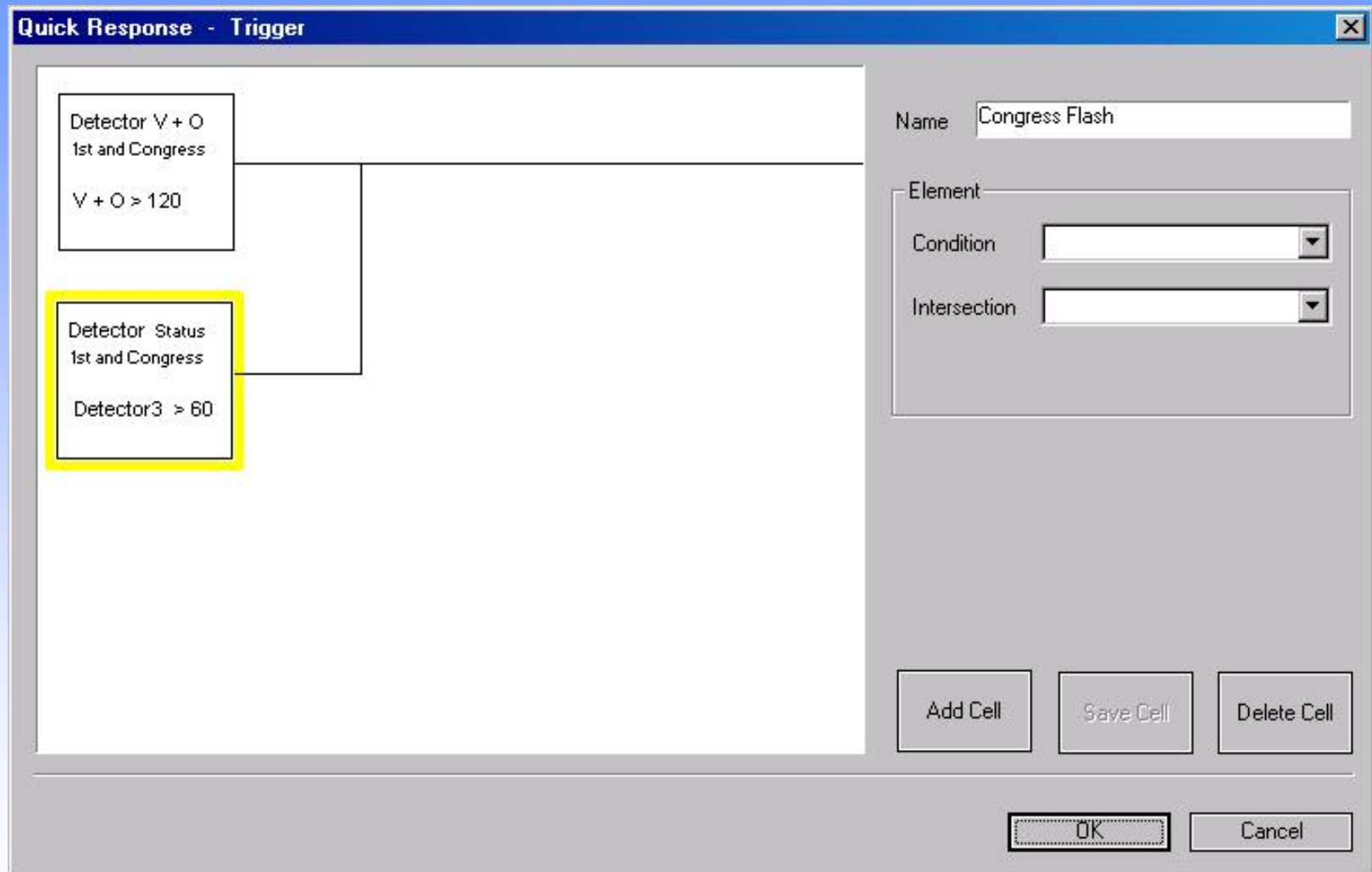
Execution Offset: Hrs Min

Command:

Group Code:

Pattern:

LOGIC DIAGRAMS



SYNCHRO



OUTPUT REVIEW

THE USER CAN
COPY THE
SYNCHRO OUTPUT
VALUE TO ACTRA
BY PRESSING THE
COPY BUTTON

SynReview - first run

Help

Reviewing Setting

Pattern Mode : 112 Review Data >>

Synchro Timing File : D:\temp5\outtiming.csv ... Exit

Intersection Selection

Synchro data is copied to Actra!

Main St. @ 1st Ave.
Main St. @ 2nd Ave.
Main St. @ 3rd Ave.
Main St. @ 4th Ave.

Copy Synchro Data to Actra

Timing Parameters

Current Actra Setting Synchro Suggested

Cycle Length 110 110

Offset 12 12

Leading Phase 1358 1358

Split

Phase	Approach	Actra	Synchro
1	WBL	27	27
2	EBT	30	30
3	NBL	27	27
4	SBT	26	26
5	EBL	27	27
6	WBT	30	30
7	SBL	27	27
8	NBT	26	26
9		0	0
10		0	0

Ready NUM

SYNCHRO



**THE USER
CAN SET UP
THE TIME
PERIOD FOR
VOLUME
DATA
COLLECTION
IN 15
MINUTES
INTERVALS**

SynVolDef - first run

Help

Select Intersections

- ☒ Main St. @ 1st Ave.
- ☒ Main St. @ 2nd Ave.
- ☒ Main St. @ 3rd Ave.
- ☒ Main St. @ 4th Ave.

Select All

Clear All

Start

Date 5/11/01 Time 3:00:00 PM

Stop

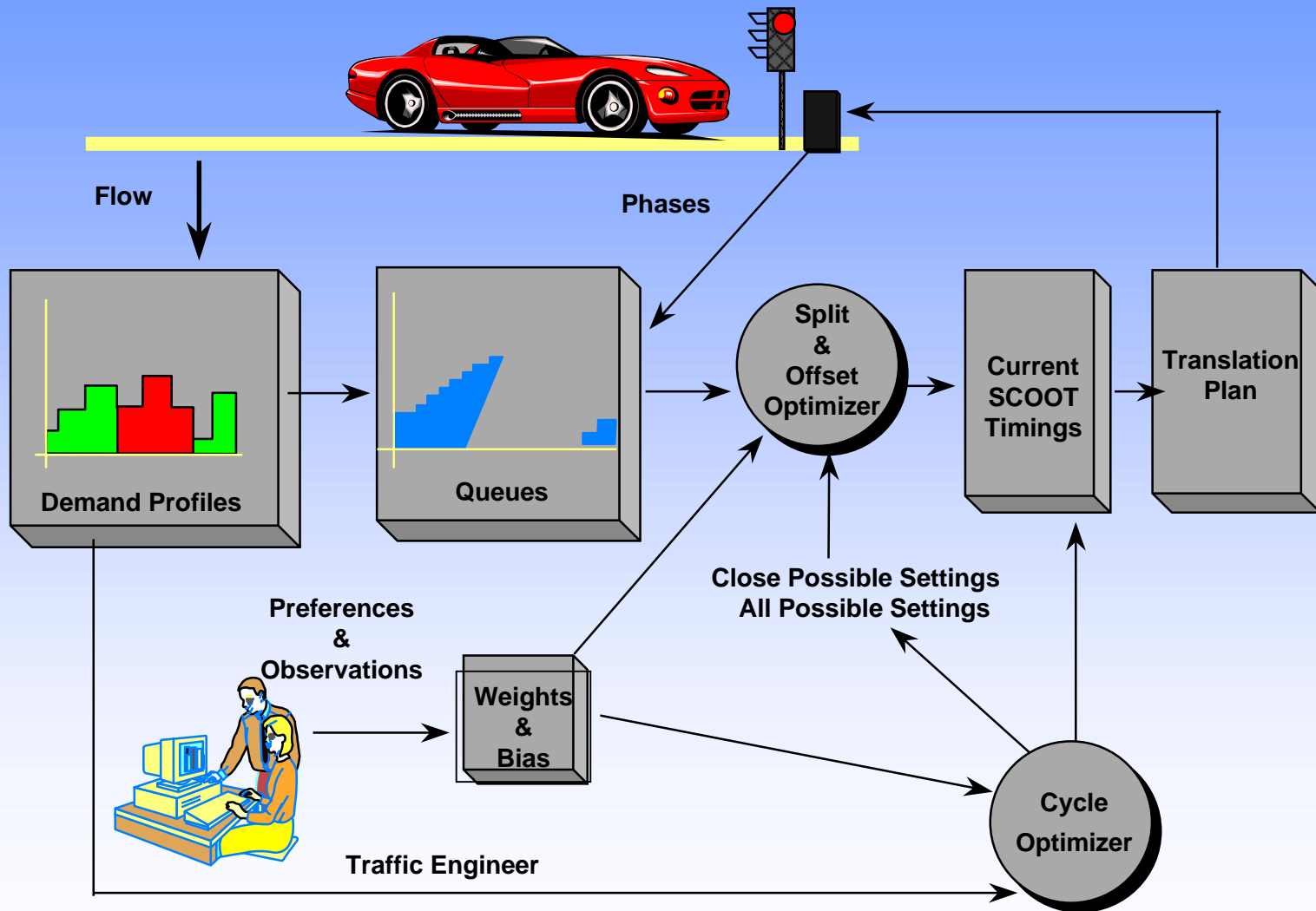
Date 5/11/01 Time 6:00:00 PM

Save Cancel

Ready NUM



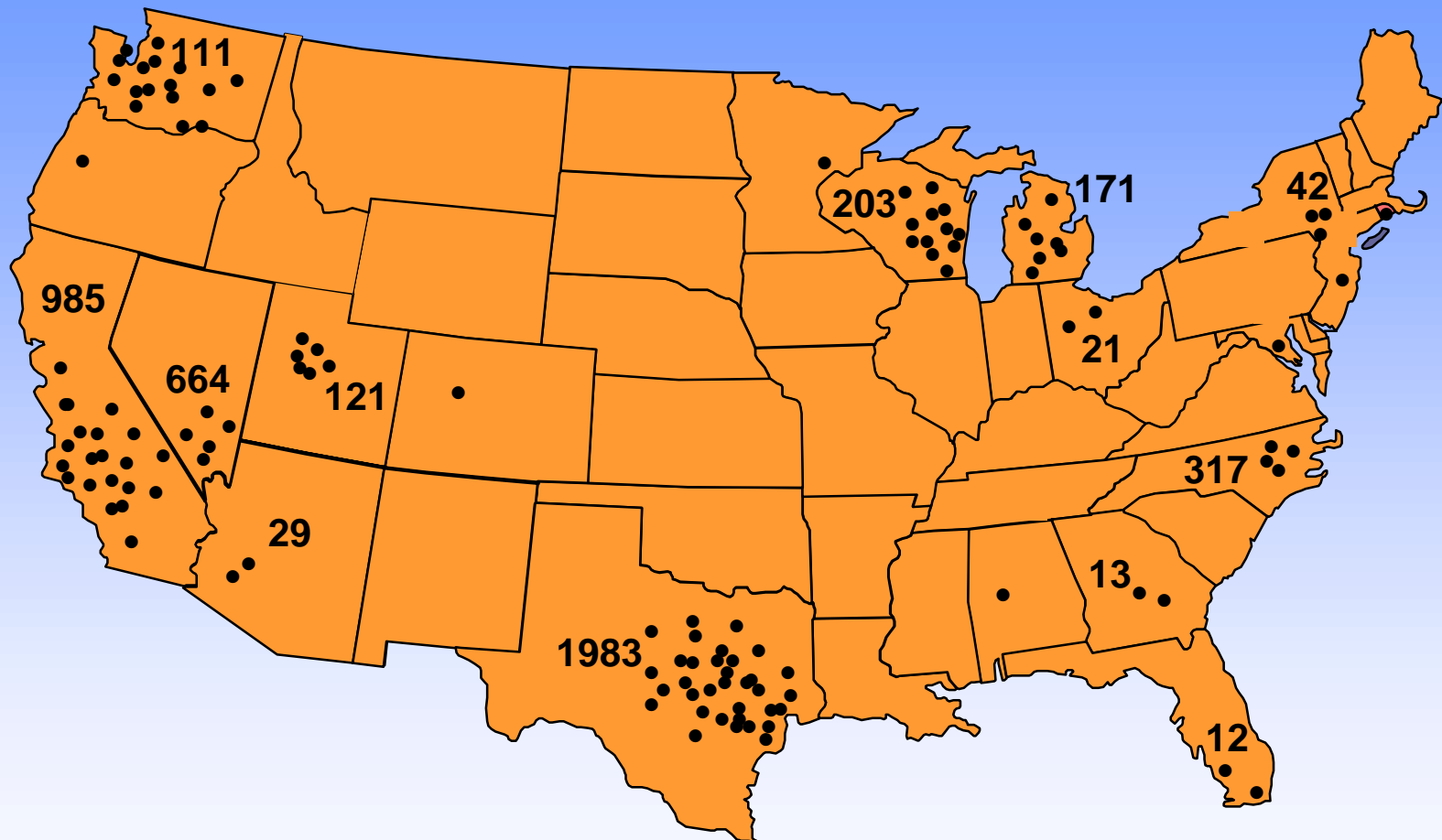
SCOOT GENERAL OVERVIEW



ITS CABINET



2070/ATC CONTROLLER UNITS INSTALLED



SE-PAC 2070/ATC SOFTWARE



**INCORPORATES 15 YEARS OF ACTUAL “ON-STREET”
TRAFFIC MONITORING AND CONTROLLING EXPERIENCE**

**SIX COORDINATION
MODES**

**ADAPTIVE TRAFFIC
CONTROL**

**PREEMPTIVE/
PRIORITY
ROUTINES**

**NUMEROUS
STANDARD
REPORTS**

**BUILT-IN
DIAGNOSTICS**

**TIME BASE
CONTROL**



2070 & ITS CABINET WORKSHOP - AUGUST 2001

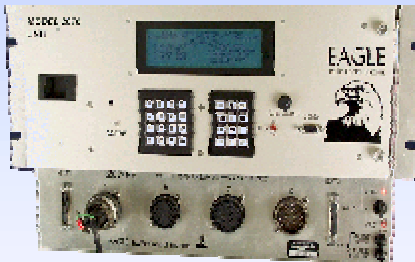
VERSIONS OF THE 2070/ATC



**2070/ATC
ADVANCED REPLACEMENT
FOR THE 170 & 170E**



**2070L
BLANK FRONT PANEL
VME OPTIONAL**



**2070N
NEMA TS1 COMPATIBLE**



**2070 ITS
NO FIELD I/O
USES SERIAL SDLC
CONNECTION TO SIU**



2070 & ITS CABINET WORKSHOP - AUGUST 2001

ALL TEES HARDWARE DEVICES

CONTROLLERS & SUBASSEMBLIES:

- 2070 Unit Chassis
- 2070-1A CPU Module, 2 board, VME, Data Key, OS/9™
- 2070-1B CPU Module, 1 board, Serial Hub, Data Key, OS/9™, no VME
- 2070-2A Field I/O for Type 170 cabinet wiring, no Data Key
- 2070-2B Field I/O Interface for NEMA or ITS cabinet wiring
- 2070-2C Field I/O for TS-2, Type 2
- 2070-3A Front Panel Module, 4 lines of 40 characters, 2 keypads
- 2070-3B Front Panel Module, 8 lines of 40 characters, 2 keypads
- 2070-3C Front Panel Module, blank, C60 connector for computer
- 2070-4A Power Supply Module, 10 amp, with +5 V Standby for VME rack
- 2070-4B Power Supply Module, 3.5 amp, no +5 V Standby for VME rack
- 2070-5A VME Cage Assembly, 5 slot, for 2070-1A, requires 2070-4A
- 2070-5B MCB Mounting Assembly, 1 slot, for 2070-1A
- 2070-8 NEMA Interface Module, TS-1 or TS-2 Type 2 cabinet wiring
- 2070-9 2070N Back Cover for 2070-8A (optional, not required)

COMMUNICATIONS MODULES:

- 2070-6A Async/Modem Serial Comm Module, 1200 bps
- 2070-6B Async/Modem Serial Comm Module, 9600 bps (short distance)
External Modem, 1200-19200 bps, with cable for 2070-7
- 2070-6C Dial-up modem ITU V.90, 2400 to 57000 bps (Future)
- 2070-6D Internal Fiber Modem, 1300 nM single mode
- External Fiber Modem, 1300 nM single mode, with 2070-7 cable
- 2070-7 Async Serial Comm Module, EIA-232, for external modem
- 2070-7A Async Serial Comm Module, EIA-232, for direct connect
- 2070-7B Async Serial Comm Module, EIA-485, for twisted pair
- VME Ethernet Adapter, OS/9 drivers, requires 2070-1A, 2070-5A
- VME EIA-232 Adapter, 8 channels, requires 2070-1A, 2070-5A

EAGLE PART

- AAD14171P001
- AAD13981P001
- AAD13983P001
- AAD14081P003
- AAD14243P001
- AAD14839P001
- AAD14172P001
- AAD14172P002
- AAD14172P003
- AAD11944P001
- AAD11944P002
- AAD11938P001
- AAD13939P001
- AAD12163P003
- FFD12168P001

- AAD11942P002
- AAD11942P001

AAD14251P001

- AAD13974P001
- AAD13403P001
- AAZ14257P001
- AAD11943P001
- AAD13982P001
- AAD13929P001
- AAD14004P001
- AAD14246P001



SOFTWARE AND ACCESSORIES

• <u>SOFTWARE:</u>	<u>EAGLE PART</u>
• Eagle EPAC™ Traffic Control Software	MBU14247P312
• Gardner Transportation NEXTPHASE™ Traffic Control Software	MBU13995P100
• Los Angeles DOT Traffic Control Software	Demo, only
• Eagle VALSUITE controller self-test software (requires loop-back)	MBU14003P100
• Eagle MDMTEST2 modem self-test software (requires loop-back)	MBU14024P100
• Developers Software Kit, Microware FASTRAC, OS/9 editor, compiler, linker	MBU14019P001
•	
• <u>CABLES AND ACCESSORIES:</u>	
• Loop-Back Cable, for 2070-2A Field I/O (Type 170 104 Pin Connector)	ABW12150P001
• Loop-Back Cable, for 2070-8 Field I/O (NEMA A,B,C,D)	ABW12232P001
• Loop-Back Cable, for 2070-7, 2070-7A EIA-232 Ports	ABW12151P001
• Loop-Back Cable, for 2070-6A, 2070-6B EIA-232 Ports	ABW12152P001
• Loop-Back Cable, for 2070-6A, 2070-6B FSK Lines	ABW12233P001
• Loop-Back Cable, for 2070-8 EXT2, EIA-232	ABW12234P001
• Loop-Back Cable, for 2070-8 EXT2, FSK Lines	ABW12235P001
• Ethernet RJ-45 Cable, 6 ft, connects VME Ethernet Adapter to PC Ethernet	ABW14020P006
• EIA-232 Cable, 6 ft, connects C50 to PC COM1 to load application software	ABW14021P006
• EIA-232 Cable, 6 ft, connects 2070-3C C60 to PC COM1 as remote front panel	ABW14245P006
• EIA-232 Cable, 6 ft, connects 2070-6 C2S or C22S to EIA-232 DB-25	ABW14256P006
• FSK Cable, 10 ft, connects 2070-6 C2S or C22S to phone punch down	ABW14255P010
• EIA-232 Cable, 6 ft, connects 2070-7 to AAZ14257P001 External Fiber Modem	ABW14259P006
• Fiberoptic Cable, 2 meter, connects 2070-6D to fiberoptic patch panel	PBW04915P001
• Adapter Cable, 6 ft, connects 2070-8 NEMA 57 pin "D" to cabinet panel	ABW14258P006
• Adapter Cable, 6 ft, connects 2070-7 9-pin "D" to 2070-8 EXT2 Cable	ABW14122P006
• Developers Hardware Kit, cable and software to load operating system upgrades	AAD14248P001
• Datakey™ Programmer, includes software and cable to PC COM1	AAD14252P001



SESSION 2.5

MODEL 2070 CONTROLLER APPLICATIONS

BI Tran Systems, Inc.

A McCain Traffic Supply Company

GERRY BLOODGOOD



BI Tran Systems / McCain Traffic Supply

2070 CONTROLLER APPLICATIONS

- INCIDENT MANAGEMENT**
- TRAFFIC SIGNAL CONTROL**
- RAMP METERING**



Bl Tran Systems / McCain Traffic Supply

INCIDENT MANAGEMENT (OFFRAMP DIVERSION)

- VOLUME/OCCUPANCY/SPEED**
- EXTINGUISHABLE MESSAGE SIGNS**
- DIAL UP PAGER**

Bl Tran Systems / McCain Traffic Supply

TRAFFIC SIGNAL CONTROL

- PROGRAM 233 FROM MODEL 170**
- TRAFFIC ADAPTIVE (OPAC)**
- NEMA CABINET**



Bl Tran Systems / McCain Traffic Supply

RAMP METERING

- MULTIPLE LANES (6)**
- TRAFFIC RESPONSIVE (V/O/S)**
- 48 DETECTORS**

SESSION 2.5

2070 APPLICATIONS

ECONOLITE ASC/2070 TRAFFIC CONTROL SOFTWARE

RALPH W. BOAZ



ECONOLITE ASC/2070 SOFTWARE

- **ASC/2 FAMILY OF SOFTWARE HAS BEEN ENHANCED TO TAKE ADVANTAGE OF THE PROCESSING POWER AND MULTI-TASKING 2070 ARCHITECTURE**

ECONOLITE ASC/2070 SOFTWARE

- **HIERARCHICAL, INTUITIVE MENU SYSTEM**
 - **ON-LINE CONTEXT SENSITIVE HELP FOR EVERY SCREEN AND TOPIC**
 - **STATUS DISPLAYS FOR EACH OF THE CONTROLLER'S MAIN FUNCTIONS**
- **CONTROL FEATURES**
 - **12 PHASES**
 - **8 CONCURRENT GROUPS**
 - **2 TIMING RINGS**
 - **UP TO 16 OVERLAPS**



ECONOLITE ASC/2070 SOFTWARE

- **COORDINATOR FEATURES**
 - **64 PATTERNS EACH WITH OWN CYCLE, OFFSET AND SPLIT**
 - **3 INTERCONNECT METHODS: PLAN, TS2, AND STANDARD**
 - **AUTOMATIC PERMISSIVE PERIODS**
 - **FIXED OR FLOATING FORCE-OFFS**
- **PREEMPTION FEATURES**
 - **6 PRIORITY AND 4 BUS PREEMPTION SEQUENCES**
 - **OPTIONAL TRANSIT SIGNAL PRIORITY (TSP) SOFTWARE TO BE AVAILABLE**



ECONOLITE ASC/2070 SOFTWARE

- **TIME OF DAY (TOD) FEATURES**
 - **SEPARATE NON-INTERCONNECTED COORDINATION (NIC) AND TOD FUNCTIONS**
 - **16 DAY PROGRAMS**
 - **10 WEEK PROGRAMS**
 - **36 HOLIDAY PROGRAMS (FIXED OR FLOATING)**
 - **200 NIC PROGRAM STEPS**
 - **100 TOD PROGRAM STEPS**

ECONOLITE ASC/2070 SOFTWARE

- **DETECTOR FEATURES**
 - **64 VEHICLE DETECTOR INPUTS**
 - **16 SYSTEM DETECTOR INPUTS**
 - **DETECTORS INDIVIDUALLY ASSIGNABLE TO PHASE AND FUNCTIONS**
 - **LOCK/NON-LOCK FUNCTION BY DETECTOR INPUT**

ECONOLITE ASC/2070 SOFTWARE

- **COMMUNICATION FEATURES**
 - **OPEN SYSTEM PROTOCOL SUPPORT INCLUDING NTCIP AND AB3418**
 - **FULL DATABASE UPLOAD AND DOWNLOAD**
 - **RUNS DIFFERENT PROTOCOLS CONCURRENTLY ON MULTIPLE SERIAL PORTS**



ECONOLITE ASC/2070 SOFTWARE

- **SOFTWARE INSTALLS IN ABOUT 8 MINUTES**
 - **REQUIRES NO USER INTERACTION**
 - **AUTO-CONFIGURES FOR 170, NEMA TS-2, NEMA TS-1 AND 2070/ITS CABINETS**
 - **CUSTOMIZED I/O MAPPING**



SESSION 2.5

DMJM LOCAL PROGRAM

BOB RUSSO



PROGRAM FEATURES

- 16 Vehicle Phases
- 16 Pedestrian Phases
- 16 Vehicle Overlaps w/ Preemption Omission
- 16 Pedestrian Overlaps Phases
- 17 Individual Timing Functions for each phase
- Completely customizable sequencer
- Concurrent Service of 0 – 4 Rings
- Sequences containing 0 – 8 phase compatibility barriers
- Simultaneous Quad/Dual ring operation
- 38 Individually control functions and features for each phase



COORDINATION FEATURES

64 Time-Based Coordination Plans each having

- **4 Phase control Data Sets**
 - **4 Phase timing Sets**
 - **4 Phase Sequence Sets**
 - **4 Offsets**
 - **16 Dynamic Omit and 16 Recall Plans**
-
- **Auto-calc of Permissive Times**
 - **Selectable Min cycle times during transition**
 - **Pedestrian force-off adjustment**
 - **Sync with main and side streets simultaneously (Cross-grids)**
 - **Coordination correction using 3 selectable optimization modes**



PREEMPTION/SCHEDULER

PREEMPTION

8 EV with 2 priority levels

4 Railroads

2 Special (16 interval defined)

SCHEDULER

256 TOY/TOD/DOW events

3 Event priority levels

Each Event can implement plans 1- 64, flash or free, and selectable options such as:

Recall Max 2 Soft Veh/Ped Recall

Lead/Lag

Min/Max Recall Detector Monitoring

Detector Counting

Split Monitoring Logic Macros

Deactivate Outputs



PROGRAMMABLE INPUTS

Inputs Are Assignable for the following functions:

Pin Connections	Max Inhibit
Force off A&B	CNA
Min/Max Recall	TBC Time Select
TOD/DOW Reset/Sync	Stop time
Cabinet Flash	Ext Alarms
Free/Flash	EVA/RR/SP Pre
Door Open	
Holds	
Veh/Ped and/or System Detectors	
Manual Control Adv/Enable	
Phase Timing Back Select	

PROGRAMMABLE OUTPUTS

Outputs Are Assignable for the following functions:

- **Pin Connections**
- **3 Flasher**
- **Vehicle/Pedestrian outputs**
- **4 Advanced Warning Beacons**
- **TBC Plan Status**
- **8 EVA, 4 RR and 2 Special Preemption**
- **Flash/Select/Status**
- **Cabinet Flash**
- **Watch Dog**

SESSION 3

ITS CABINET FAMILY

- **TRANSPORTATION ELECTRICAL EQUIPMENT SPECIFICATIONS (TEES) DOCUMENT, DATED NOV. 19, 1999 PLUS ADDENDUMS**

FLOYD WORKMON



SECTION 3.1

VERSIONS AND SYSTEMS

- **TEES CHAPTERS 1, 3, 5 AND 7**
- **MODULAR DESIGN WITH ALL UNITS, ASSEMBLIES, CAGES AND HOUSINGS INTERCHANGEABLE**

CABINET - VERSIONS

- **TRAFFIC SIGNAL APPLICATION**
 - . **MODEL 340**
 - . **MODEL 342**
 - . **MODEL 346**
- **TRAFFIC MANAGEMENT APPLICATIONS**
 - . **MODEL 354**
 - . **MODEL 356**

MODEL 340 CABINET

- **HOUSING #3 / TWO CAGES #1**
- **J PANELS #1 AND DRAWER**
- **AC SERVICE ASSEMBLY**
- **AC POWER ASSEMBLY**
- **AC CLEAN POWER ASSEMBLY**
- **DC / CABINET COMMUNICATION ASSEMBLY**
- **THREE INPUT ASSEMBLIES EACH WITH AN SIU**
- **TWO 14 PACK (FOUR 6 PACKS) OUTPUT ASSEMBLIES EACH WITH SIU, AMU AND FTR UNITS**
- **PDA #5 WITH CMU, 2 FLASHERS AND TWO POWER SUPPLY UNITS**

MODEL 342 CABINET

- **HOUSING #1 / CAGE #1**
- **J PANELS #1 AND CONTROLLER SHELF**
- **AC SERVICE ASSEMBLY**
- **AC POWER ASSEMBLY**
- **DC / CABINET COMMUNICATION ASSEMBLY**
- **TWO INPUT ASSEMBLIES EACH WITH AN SIU**
- **14 PACK OUTPUT ASSEMBLY WITH SIU, AMU AND FTR UNITS**
- **PDA #5 WITH CMU, 2 FLASHERS AND TWO POWER SUPPLY UNITS**

MODEL 346 CABINET

- **HOUSING #2 / CAGE #2**
- **J PANELS #2 AND CONTROLLER SHELF**
- **AC SERVICE ASSEMBLY**
- **AC POWER ASSEMBLY**
- **DC / CABINET COMMUNICATION ASSEMBLY**
- **INPUT ASSEMBLY WITH SIU**
- **14 PACK OUTPUT ASSEMBLY WITH SIU, AMU AND FTR UNITS**
- **PDA #5 WITH CMU, 2 FLASHERS AND TWO POWER SUPPLY UNITS**

MODEL 354 / 356 CABINETS

- **MODELS 354 AND 356 ARE IDENTICAL EXCEPT AS NOTED**
- **HOUSING #1 / CAGE #1 (MODEL 356 UTILYZES HOUSING #2 / CAGE #2)**
- **J PANEL #1 AND CONTROLLER SHELF**
- **AC SERVICE ASSEMBLY**
- **AC POWER ASSEMBLY**
- **DC / CABINET COMMUNICATION ASSEMBLY**
- **INPUT ASSEMBLY WITH SIU**
- **6 PACK OUTPUT ASSEMBLY WITH SIU, AMU AND FTR UNITS**
- **PDA #6 WITH CMU AND TWO POWER SUPPLY UNITS**



CABINET COST “GUESSTIMATES”

- **MODEL 340:**

- **. PURCHASED BY HARRIS COUNTY, TEXAS
\$11,200 WITH 2070 LITE CONTROLLER \$2100**

- **MODEL 342:**

- **. PURCHASED IN QUANTITY OF 100 UNITS /
QUALIFIED PRODUCT LIST (QPL) \$5K - \$6K**



SYSTEM PERIPHERALS

- **J PANELS**
- **POLICE PANEL**
- **VENTILATION AND CONTROL**
- **OPTIONS:**
 - . **CABINET ILLUMINATION**
 - . **SHELVES AND DRAWERS**
 - . **EXTERNAL COMMUNICATION TERMINATION ASSEMBLY (ECTA) MODULE**

SESSION 3.2

HOUSINGS, CAGES AND ASSEMBLIES

RON JOHNSON



2070 & ITS CABINET WORKSHOP - AUGUST 2001

HOUSING 1



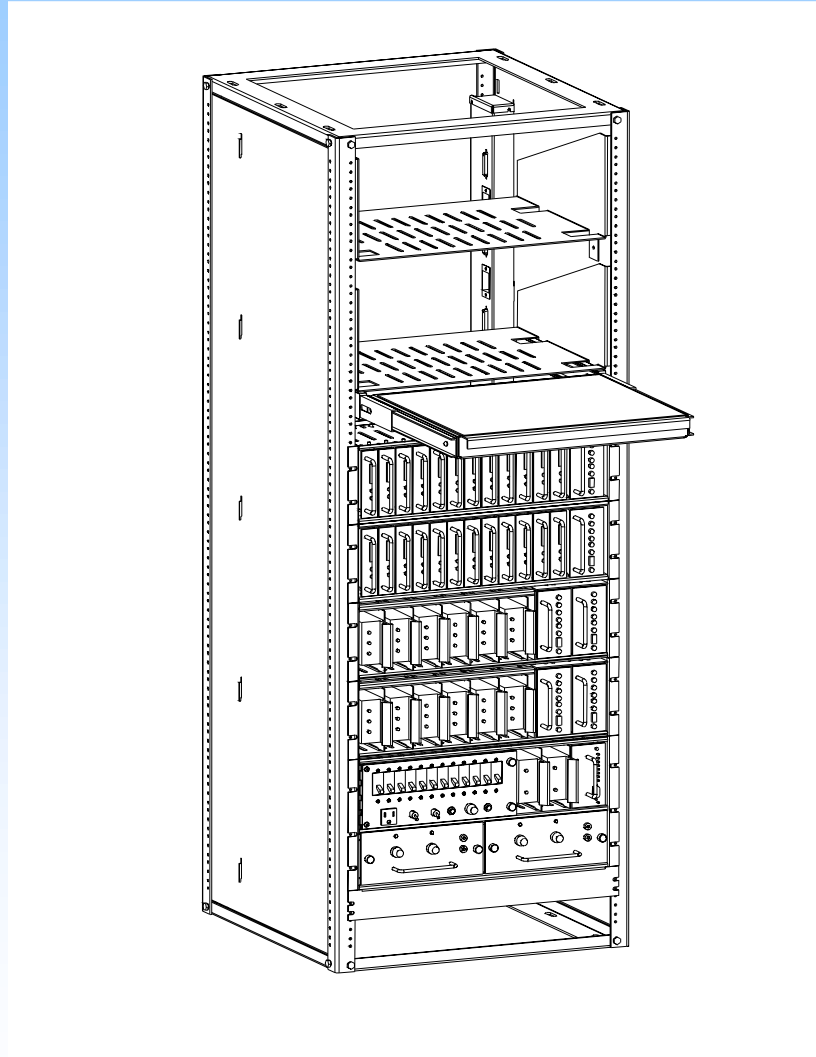
2070 & ITS CABINET WORKSHOP - AUGUST 2001

HOUSING 3

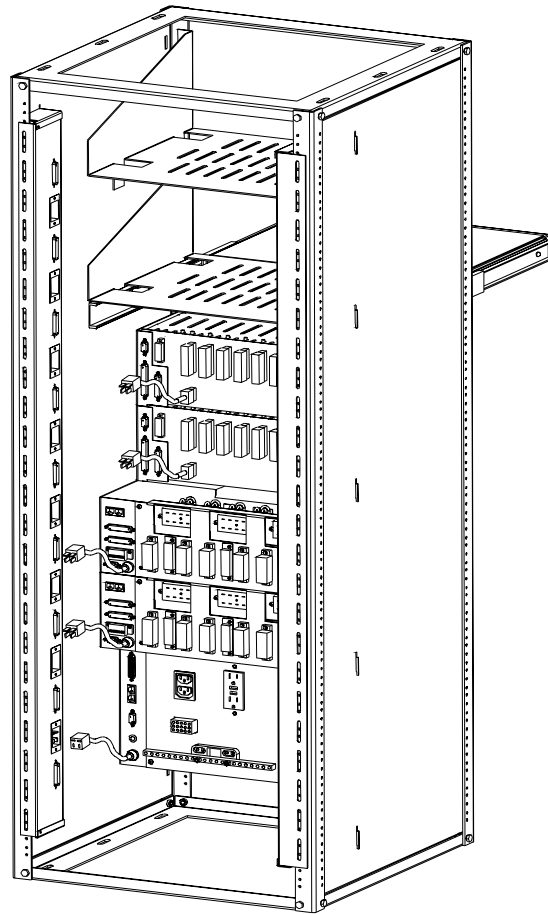


2070 & ITS CABINET WORKSHOP - AUGUST 2001

ITS CABINET CAGE ASSEMBLY



ITS CABINET CAGE ASSY



INPUT ASSEMBLY

SUPPORTS TWELVE INPUT DEVICES PLUS SIU (TWO OR FOUR CHANNEL DETECTORS OR INPUT DEVICES).

170 DETECTORS AND ISOLATORS ACCEPTED.

22 PIN DOUBLE SIDED EDGE CONNECTOR PROVIDED TO ACCOMMODATE DEVICES.

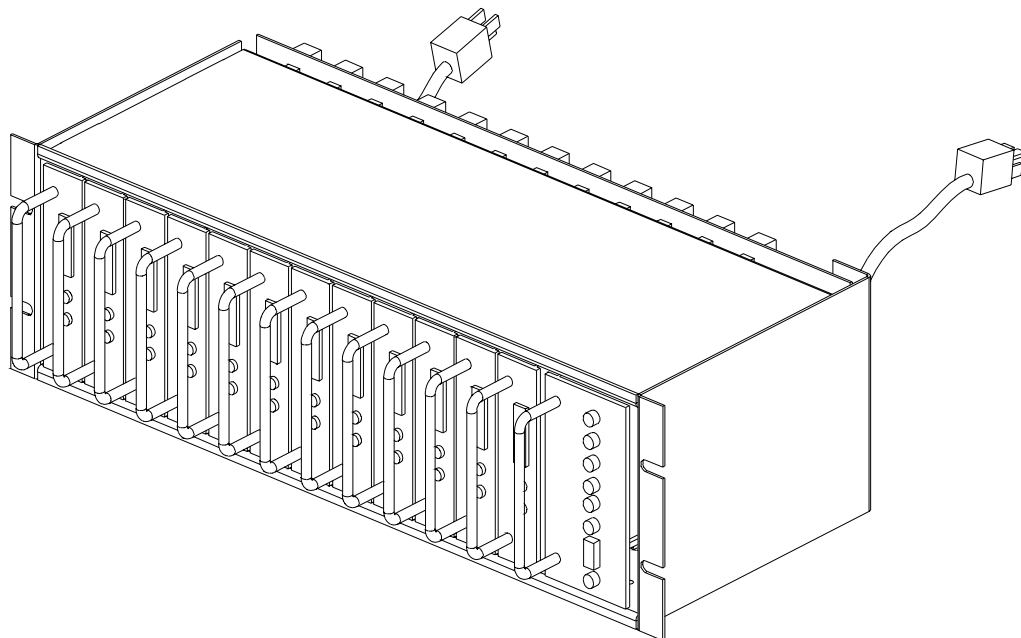
PLUGGABLE FIELD CONNECTORS FOR EASY INSTALLATION OR REMOVAL.

UP TO FIVE INPUT ASSEMBLIES SUPPORTED IN RACK.



2070 & ITS CABINET WORKSHOP - AUGUST 2001

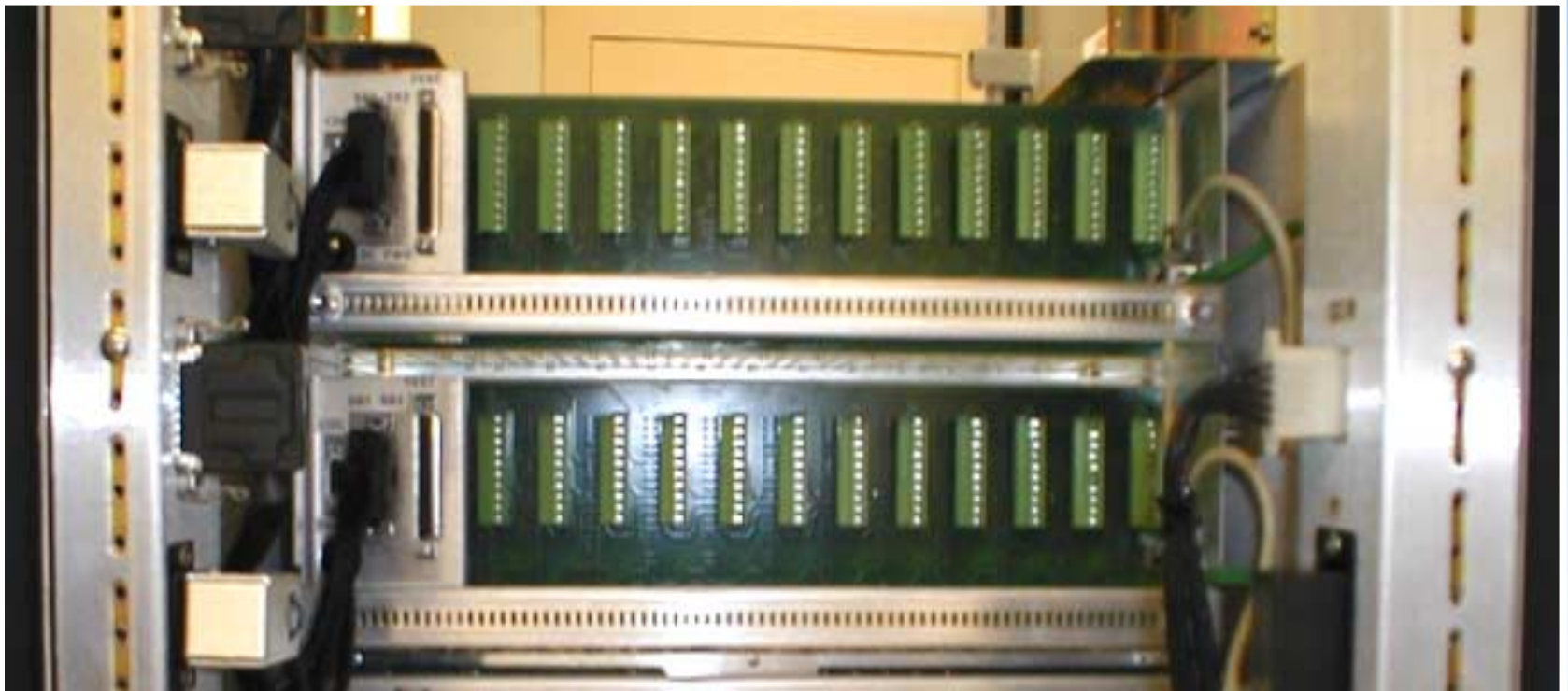
INPUT ASSEMBLY



INPUT ASSEMBLY



INPUT ASSEMBLY (REAR)



6/14 PACK OUTPUT ASSEMBLIES

ACCEPTS 6 OR 14 SWITCHPACKS WITH AN AMU AND SIU.

CONTAINS THREE FLASH TRANSFER RELAYS AND SIX FLASH PROGRAM BLOCKS FOR EACH OF THE SIX SWITCHPACKS.

WILL CONTAIN TORROID COILS FOR CURRENT MEASUREMENT OF SWITCHPACK OUTPUT (FUTURE)

PLUGGABLE FIELD OUTPUT CONNECTORS FOR EASY REMOVAL AND INSTALLATION.

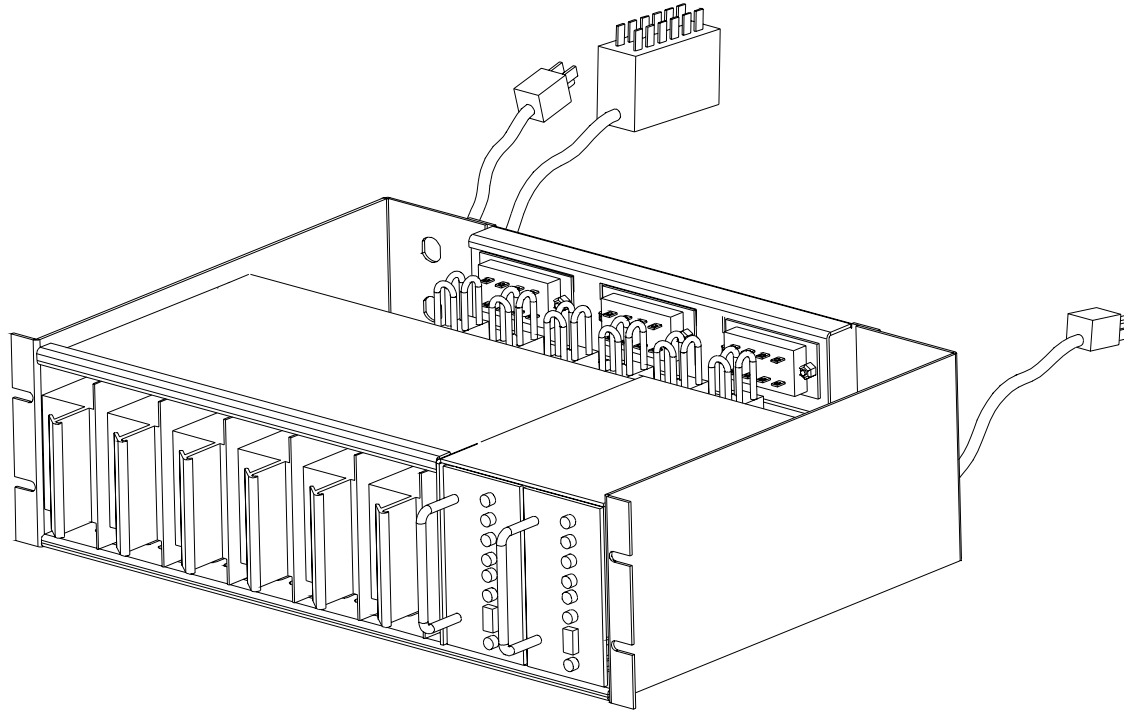
PLUGGABLE OUTPUT PROTECTION DEVICES ie. MOVISTORS

UP TO FOUR 6 PACK ASSEMBLIES OR TWO 14 PACK ASSEMBLIES ACCEPTED IN THE RACK SYSTEM.



2070 & ITS CABINET WORKSHOP - AUGUST 2001

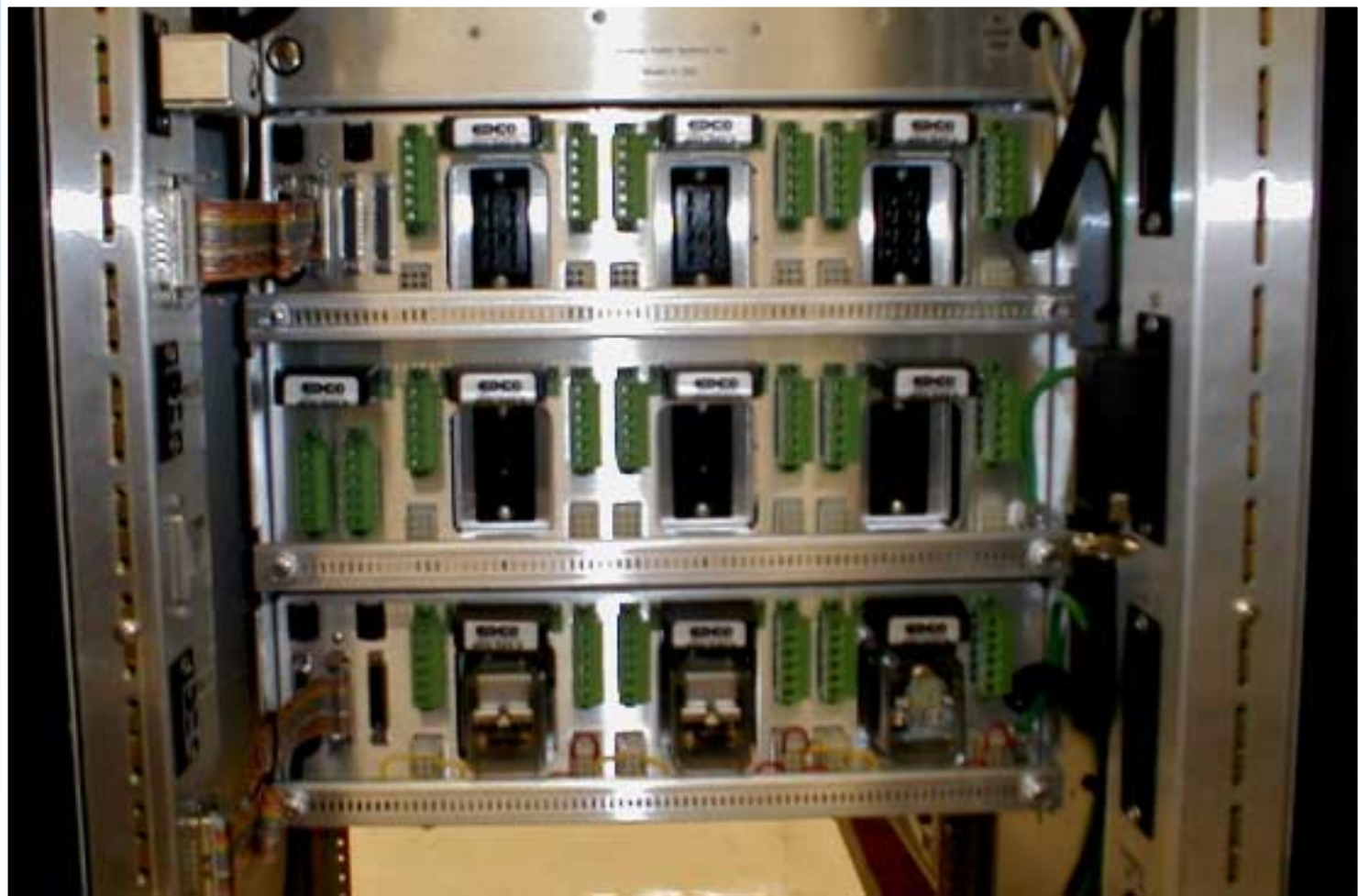
6 PACK OUTPUT ASSEMBLY



6 & 14 PACK OUTPUT ASSEMBLIES



6 & 14 PACK OUTPUT ASSEMBLIES



2070 & ITS CABINET WORKSHOP - AUGUST 2001

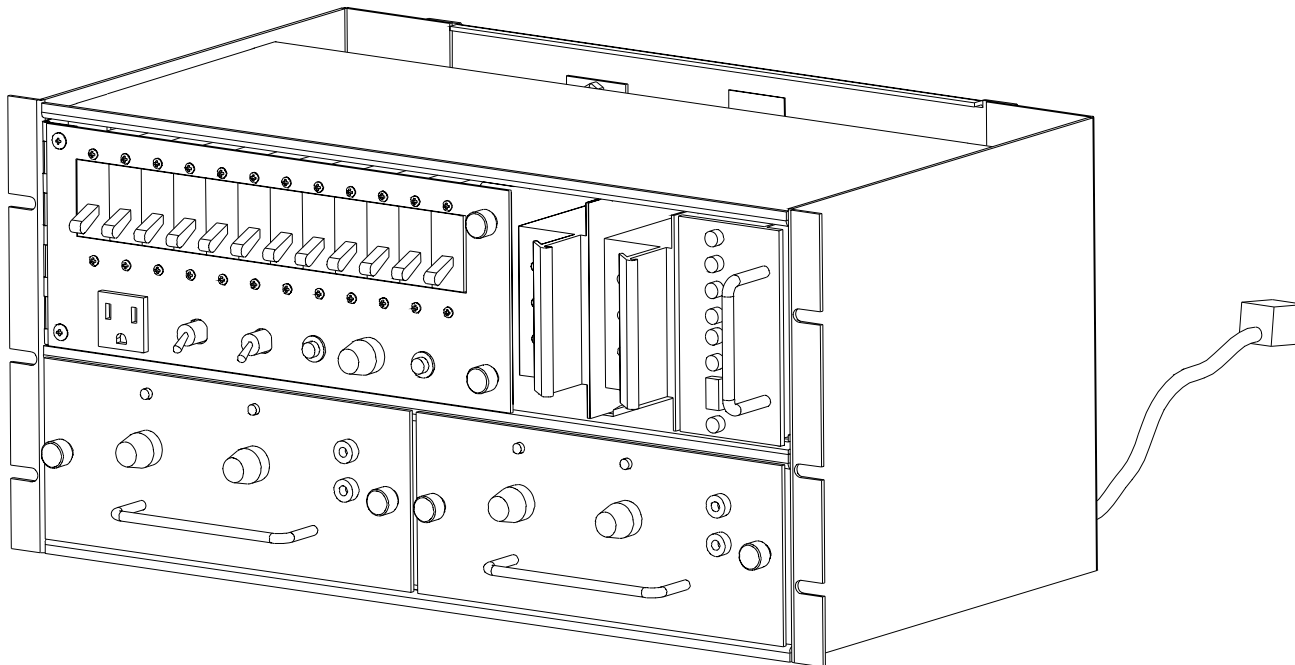
PDA 5/6

Reza Roozitalab



2070 & ITS CABINET WORKSHOP - AUGUST 2001

PDA 5



PDA 5 INSTALLED



2070 & ITS CABINET WORKSHOP - AUGUST 2001

APPLICATIONS:

PDA #5: USED FOR TRAFFIC SIGNAL CABINET APPLICATIONS (E.G., 340, 342 & 346).

PDA #6: USED IN TRAFFIC MANAGEMENT CABINET APPLICATIONS (E.G., 354).

FEATURED:

STANDARD 19" EIA RACK COMPATIBLE.

MODULAR DESIGN FOR INTERCHANGEABILITY.

FRONT DOOR ACCESS TO THE INSIDE.

HOUSES 12 & 24 VOLT POWER SUPPLIES & CABINET MONITOR UNIT (CMU).



PDA #5

FRONT INCLUDES: CIRCUIT BREAKERS, SIGNAL SWITCHES & SERVICE RECEPTACLES.

REAR INCLUDES: SERIAL BUSES, DC PLUG, AC SIGNAL POWER, CABINET CONNECTOR & SERVICE RECEPTACLE.

INSIDE INCLUDES: MERCURY CONTACTOR.

THE CMU, 12 & 24 VOLT POWER SUPPLIES AND FLASHER PLUGS FROM THE FRONT.

PDA #6

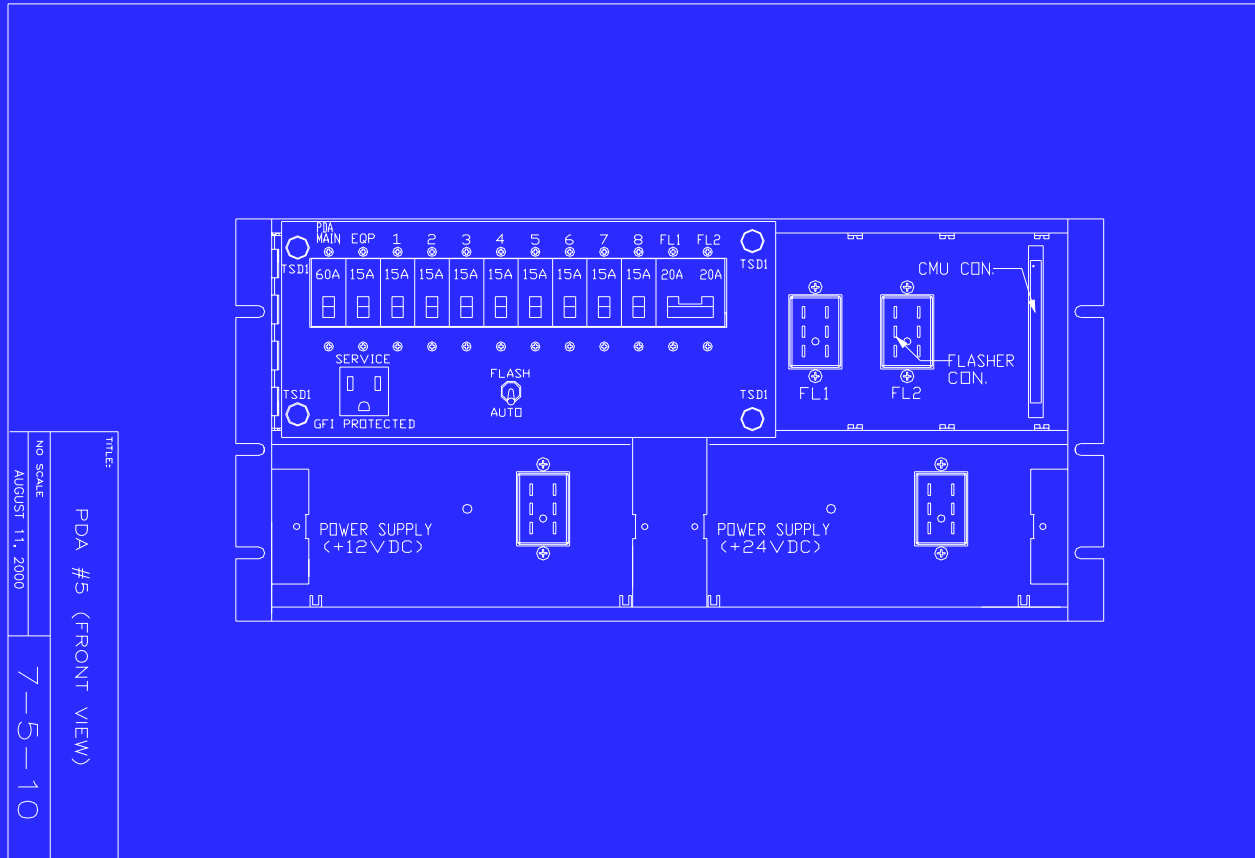
PDA #6 REAR IS THE SAME AS PDA #5'S.

DIFFERENCES ARE:

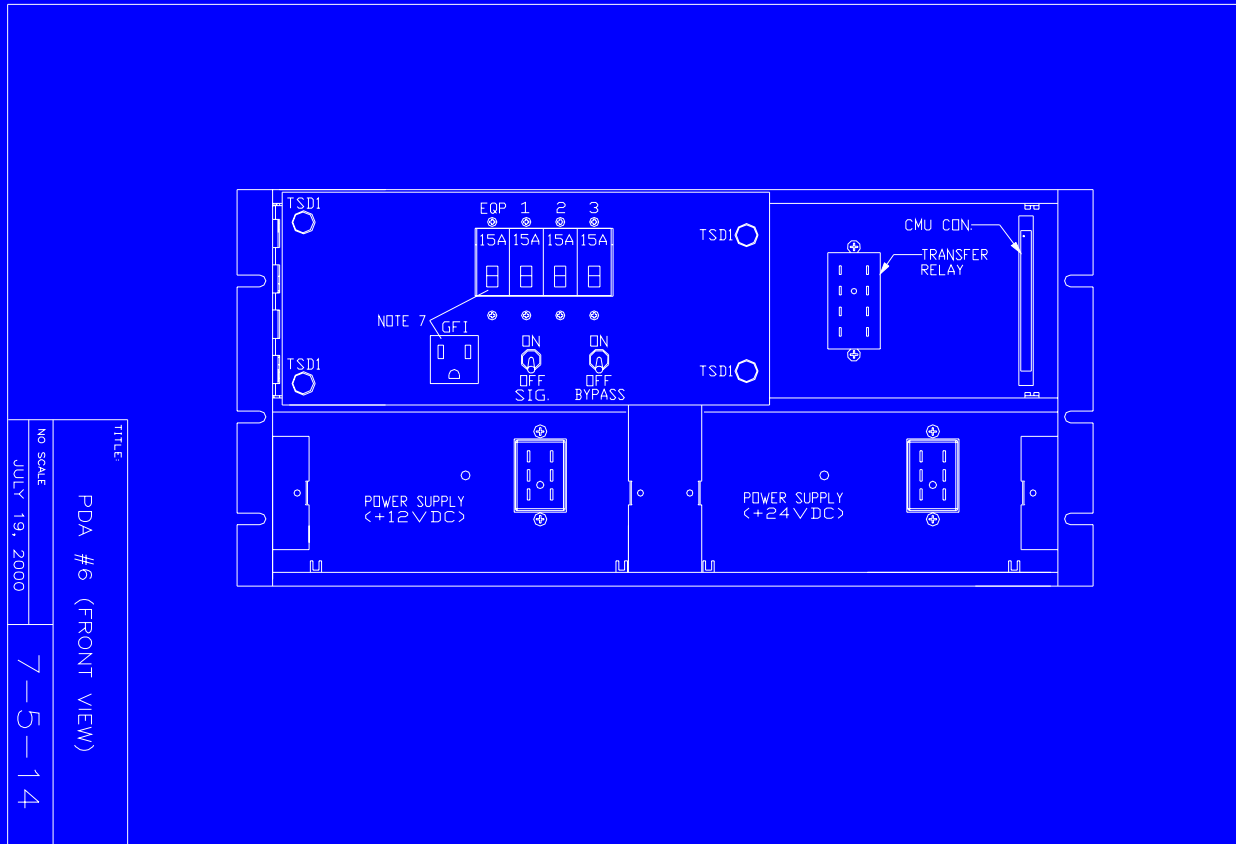
LESS CIRCUIT BREAKERS, SIMPLER WIRING AND INSTEAD OF HOUSING TWO 204-FLASHERS, IT HOUSES A 430 FLASH TRANSFER RELAY.



PDA #5

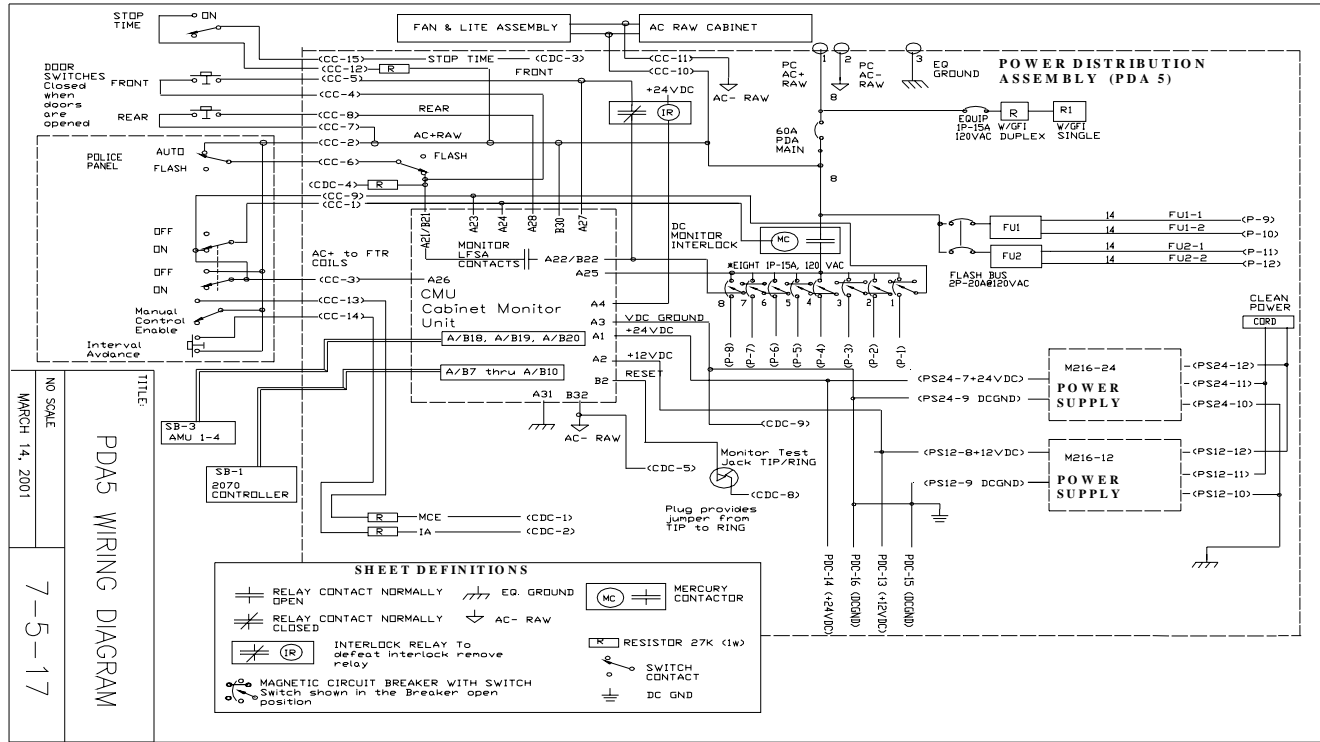


PDA #6



PDA #5 WIRING DIAGRAM

7-5-20



MODULAR BUS ASSEMBLIES

SERVICE PANEL ASSEMBLY: PROVIDES TERMINATION AND THE MAIN BREAKER FOR POLE SERVICE, AND FILTERING BY WAY OF A PLUGGABLE FILTER FOR CLEAN POWER TO THE CONTROLLER AND OTHER ASSEMBLIES.

AC POWER ASSEMBLY: PROVIDES INTERCONNECT OF THE EIGHT CIRCUIT BREAKERS TO THE OUTPUT ASSEMBLIES, FLASHER OUTPUTS AND FTR CONTROL AS WELL AS CLEAN POWER PLUGS FOR RACK ASSEMBLIES.

DC COMMUNICATIONS ASSEMBLY: PROVIDES SERIAL COMMUNICATIONS BETWEEN THE CONTROLLER AND THE SIU MODULES AS WELL AS +24VDC AND +12VDC FOR THE INPUT AND OUTPUT ASSEMBLIES.

AC CLEAN POWER ASSEMBLY: A CLEAN POWER BUS FOR USE IN THE HOUSING 3 RACK ASSEMBLY.

THE MODULAR BUS ASSEMBLIES PROVIDE A SIMPLE QUICK MEANS OF CABINET INTERCONNECT THAT WILL MAKE MAINTENANCE AND TROUBLESHOOTING FASTER AND MORE PRECISE.



SERVICE PANEL ASSEMBLY



AC+ RAW /CLEAN EXTENDED CABLE ASSEMBLY



2070 & ITS CABINET WORKSHOP - AUGUST 2001

CABINET COMMUNICATIONS

SERIAL INTERFACE UNIT (SIU) IS THE CABINET COMMUNICATIONS AND CONTROL UNIT

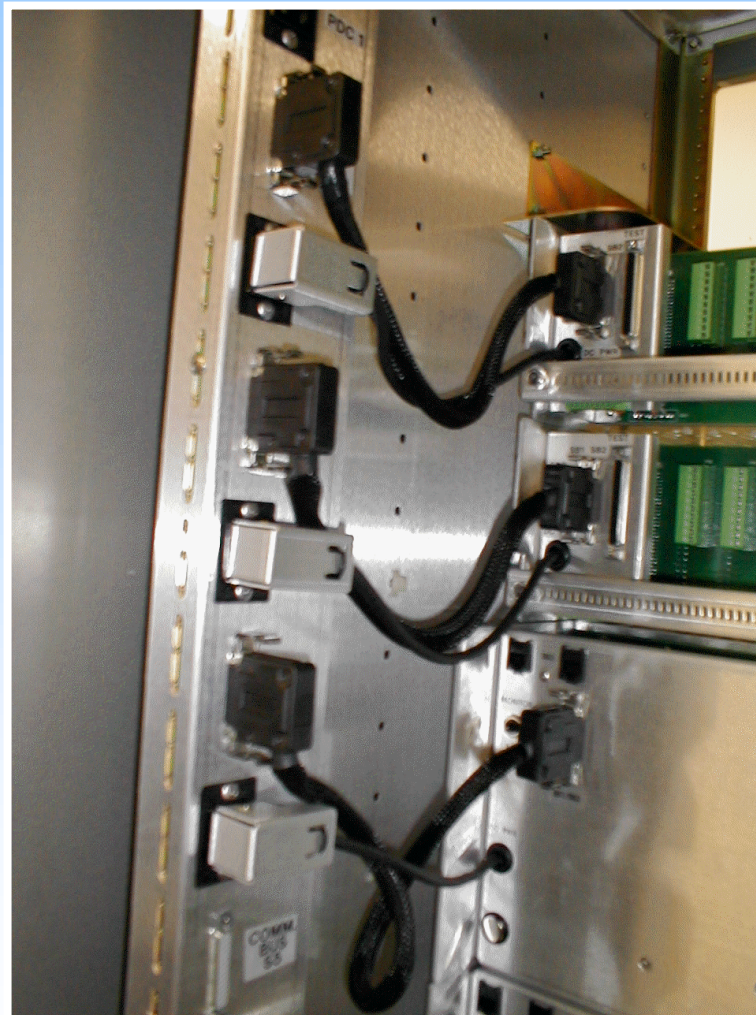
SERIAL BUS 1- COMMAND / RESPONSE, DISTRIBUTED PROCESSING OF OUTPUTS AND STATUS/DETECTION OR STATUS OF INPUTS.

SERIAL BUS 2 - COLLECTOR OF PREPROCESSED DATA FROM DETECTOR DEVICES OR MODULAR NTCIP DEVICES.

SERIAL BUS 3 - DEDICATED TO MONITOR SYSTEM



DC POWER AND SERIAL COMMUNICATIONS BUS ASSEMBLY



2070 & ITS CABINET WORKSHOP - AUGUST 2001

SESSION 3.3

ITS CABINET SERIAL BUSES 1 & 2

DAVE MILLER



ITS CABINET SERIAL BUSES 1 & 2 (SB1, SB2)

WHY SERIAL CABINETS ?

General Purpose Instrumentation Rack for:

Traffic	Ramp	Camera	Surveillance
Irrigation	VMS /DMS	Lane Use	Rail/Highway
Speed	Incident	RWIS	HAR
Freeway Lane	ETC	AVI	HOV
Comm Hub	Violations	Weigh in Motion	Battery Backup



SB1 & SB2 PHYSICAL LOCATION

Originates at 2070 ATC Controller

Chemically-bonded CAT5 twisted pairs

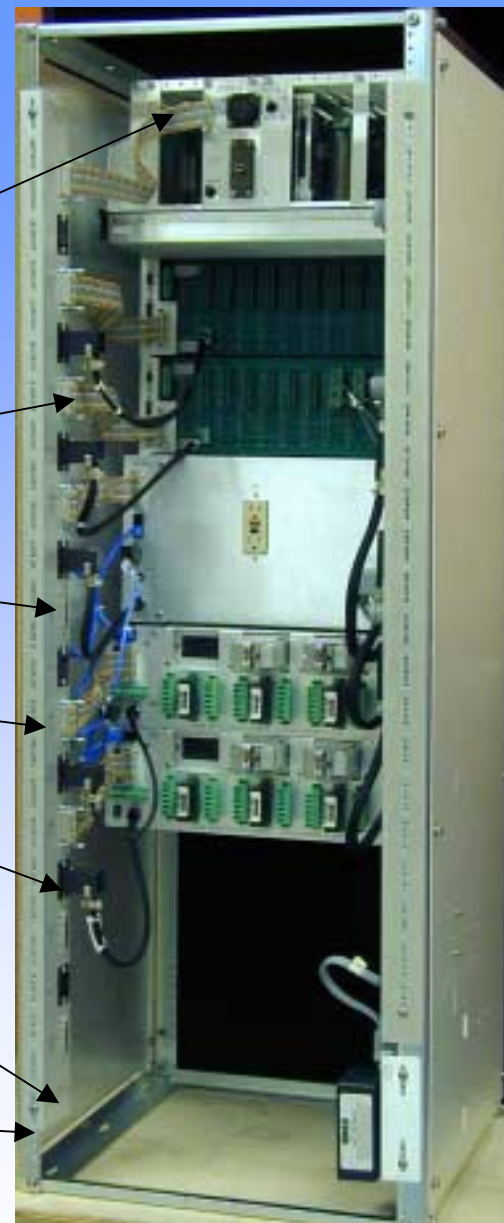
25 pin “D” for each rack location

Removable metal communications bus

+24 VDC and +12 VDC power receptacles

Terminator block at end of SB1 & SB2

Connector for bus expansion below



SB1 & SB2 ELECTRICAL CHARACTERISTICS

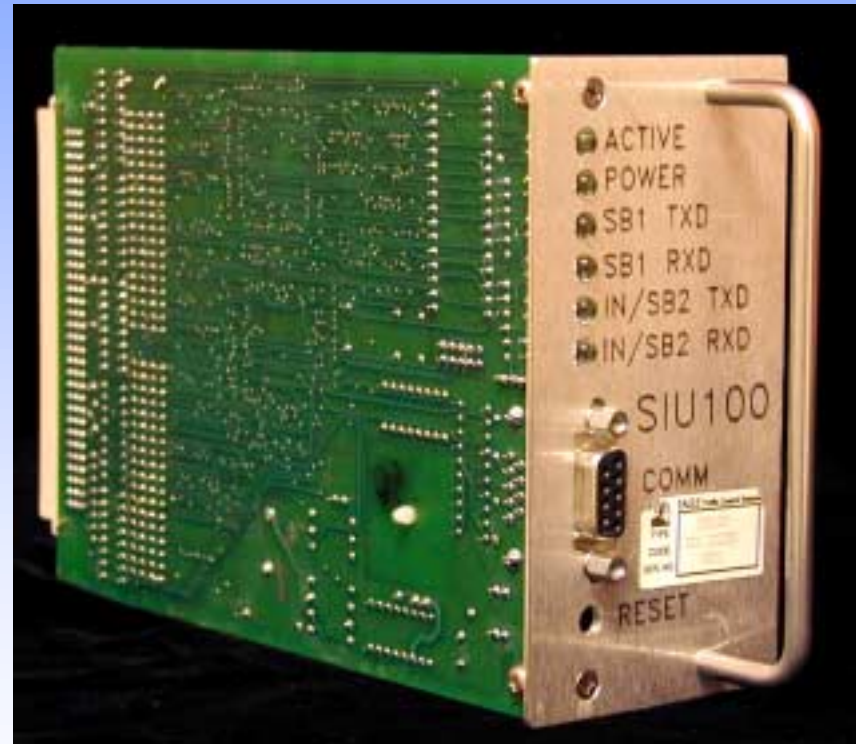
- **Category 5 (CAT5) twisted pair for TxD, RxD, TxC, RxC**
- **25-pin “D” receptacle for each rack position containing both SB1 and SB2 signals in single bundle**
- **EIA-485 balanced differential signals (DATA & $\overline{\text{DATA}}$)**
- **SB1 & SB2 originates at controller, ends at terminator block**
- **EIA-485 distances of thousands of feet with proper cable**
- **Controller can access I/O in cabinet at remote location**

SERIAL BUS 1

- **“Real-time” communications from Controller to I/O**
- **614 KBPS communications speed, SDLC frames**
- **Command / response protocol with CRC and timeouts**
- **Controller “talks” to all devices in cabinet at once**
- **Peripheral device “listens” for its address and responds**
- **Normally used with Serial Interface Units (SIU)**
- **Same protocol as Field I/O, but at different addresses**



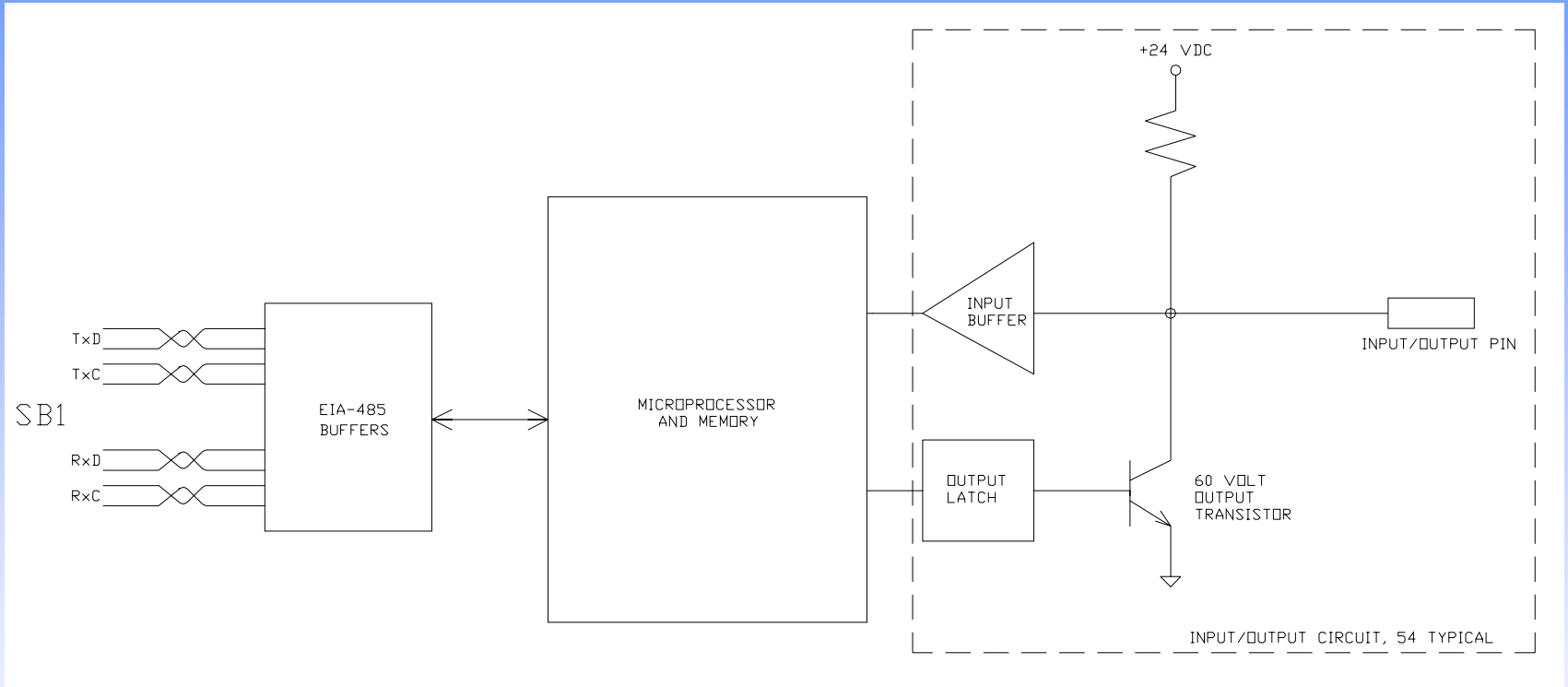
SERIAL INTERFACE UNIT (SIU)



SERIAL INTERFACE UNIT (SIU)

- **SB1 serial to parallel converter with safety features**
- **54 Input/Outputs in each SIU, ground true 24 VDC logic**
- **Each SIU responds to a unique rack address block**
- **SIU has microprocessor for input filtering and output mode**
- **SIU handles 54 detector calls / status or 14 load switches**
- **1 mS input resolution for accurate time stamps**
- **6 indicator lamps and reset switch for “hot-swap”**

SIU BLOCK DIAGRAM



- Each pin functions as both input and output (1 of 54 shown)

SIU FUNCTIONAL DESCRIPTION

- All output latches are cleared at power-up
- All output transistors are OFF at power-up
- With output OFF, pin functions as ground true input
- With output ON, pin functions as ground true output, with output state read back on the input buffer
- Output to input “wrap-around” test without cable
- “Mix and match” 54 pins individually as either IN or OUT
- 54 input addresses + 54 output addresses, no map needed



SIU FUNCTIONAL DESCRIPTION (cont'd)

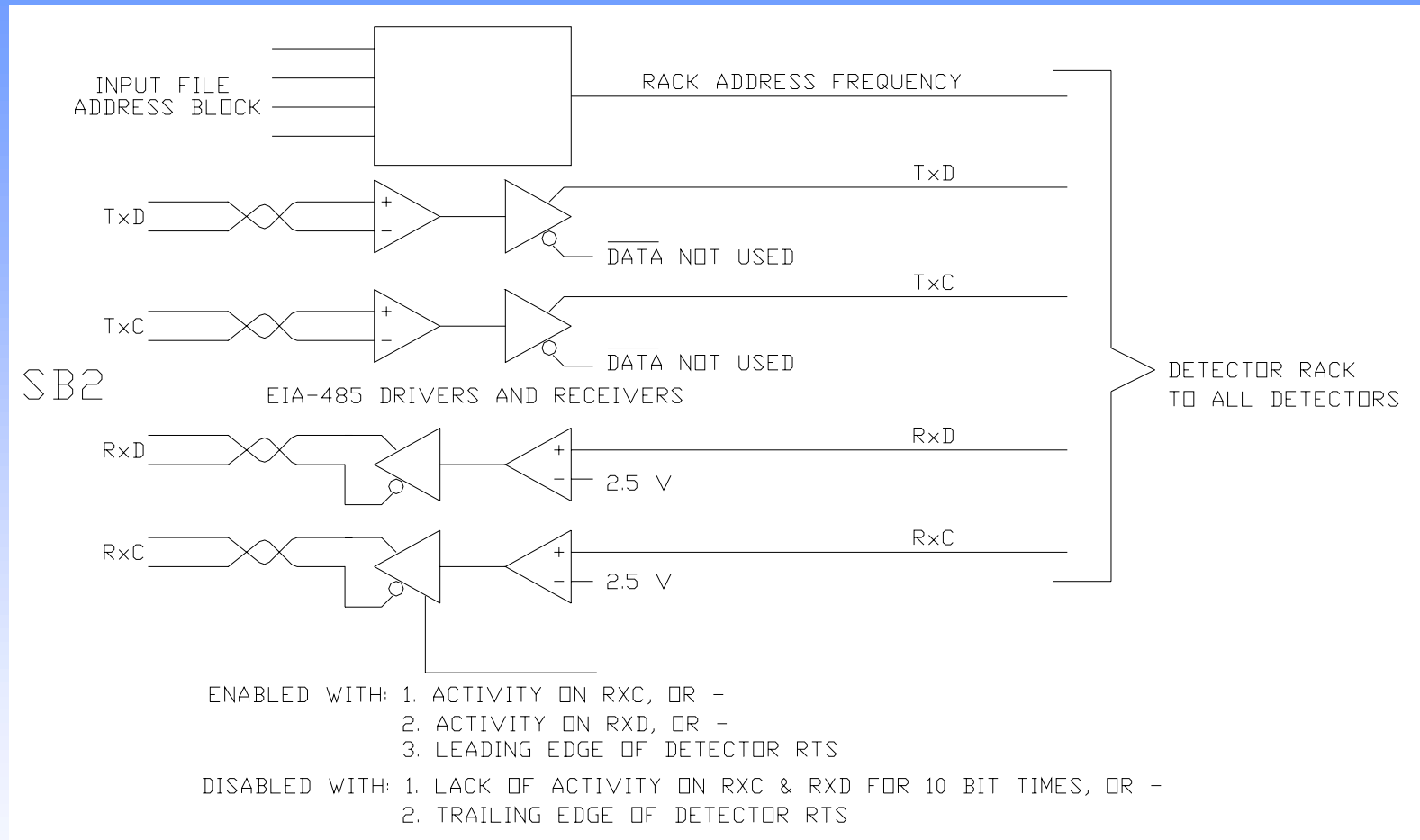
- **Inputs are “raw” or “filtered”, on command**
- **Several output modes, such as blinking, pulse**
- **Offloads processing work from controller to SIU**
- **2-second communications loss, outputs OFF**
- **Monitor checks for “lack of output” versus WDT**
- **9-pin EIA-232 connector for future use (reports, firmware)**
- **Activity lamp under control of user software**

SERIAL BUS 2

- **SB2 located in same cabinet 25-pin “D” connector, CAT5**
- **Separate communications channel directly from controller to serial detectors for loop tuning, status, etc.**
- **Used for long “conversational” messages without impacting I/O update performance**
- **Protocol differs with each vendor and hardware device**
- **Software driver comes with each hardware device and is installed on 2070 ATC, similar to PC device drivers**
- **Anticipates future serial detectors other ITS applications**



SERIAL BUS 2 BLOCK DIAGRAM



- SIU simply provides buffer between cabinet and detectors

SERIAL BUS 2 OPERATION

- **SB2 is not connected to SIU processor. SIU simply buffers the balanced differential pairs of cabinet SB2 to single-ended driver to detectors.**
- **Controller opens synchronous port if detector is SDLC, or asynchronous if detector is UART with START / STOP bits**
- **Direct connection from applications code to input devices**
- **Compatible with existing serial detectors**
- **Controller “talks” to all detectors at once. Each detector knows what input file and slot it resides in**
- **Only the detector that matches the address frame of the message received from the controller answers back.**



SESSION 3.4

CABINET EMERGENCY SYSTEM & SERIAL BUS #3

CRAIG FEARN



CABINET EMERGENCY SYSTEM

- **TWO CONDITIONS OF ACTION**
 - . **EXTERNAL CABINET BLANK INDICATION**
 - . **FLASH INDICATION**

CABINET EMERGENCY SYSTEM (CONT.)

- **BLANK INDICATION CAUSED BY:**
 - . **POLICE PANEL ON/OFF SWITCH**
 - . **PDA “MAIN” CIRCUIT BREAKER**
 - . **FLASH TRANSFER RELAY COIL “COLD”**
 - . **FLASHER UNITS NOT INSTALLED**

CABINET EMERGENCY SYSTEM (CONT.)

- **FLASH INDICATION CAUSED BY:**
 - . **POLICE PANEL AUTO/FLASH SWITCH**
 - . **PDA PANEL AUTO/FLASH SWITCH**
 - . **CONFLICT MONITOR UNIT (CMU)**
 - . **FTR COIL FAILURE**
 - . **LOAD CIRCUIT BREAKERS TRIPPED**
 - . **FRONT DOOR CLOSED WITH CMU OUT**

SERIAL BUS #3

- **MONITOR SYSTEM BUS**
- **CMU / AUXILIARY MONITOR UNIT (AMU)**
 - . **DRIVEN BY CMU VIA SDLC PROTOCOL**
 - . **COMMUNICATION USES EIA- 485 STANDARD**

SERIAL BUS #3 (CONT.)

- **AMU SENSES 2 VOLTAGES AND 2 CURRENTS PASSING BACK STATE CONDITIONS TO CMU UPON COMMAND**
- **CMU AND AMU ARE NOT VENDOR DEPENDENT**

SESSION 3.5

ITS CABINET MONITOR SYSTEM

CLYDE NEEL



Model 212 CMU Versions

	<u>A</u>	<u>B</u>	<u>C</u>	<u>-208</u>	<u>-210</u>
CONFLICTING PHASES	-	F	F	-	F
FLASHER UNIT	-	F	F	-	-
SERIAL BUS #1	F	F	F	-	-
INDICATION ERROR (MULTI/LACK/CLRNC)	-	F	-	-	F*

VERSION: A – RAMP METERING(PDA 6) -208 – Ver A, w/o SB#1
 B – TRAFFIC SIGNALS(PDA 5) -210 – Ver C, w/o SB#1
 C – TRAFFIC SIGNALS, "CAL"

ALL VERSIONS MONITOR:

Power Supplies	Monitor Error	FTR Coils
Logic Signal Error	Flash/Door Switches	AC Line
Circuit Breakers		



PURPOSE

- . MONITOR ITS CABINET CONDITIONS**
- . CAUSE TRANSFER TO SAFE CONTROL MODE**
- . REPORT DIAGNOSTIC INFORMATION**

MONITORING FUNCTIONS

- SIGNAL**
 - CONFLICTING CHANNELS**
 - MULTIPLE CHANNEL INDICATIONS**
 - LACK OF CHANNEL INDICATIONS**
 - SHORT/LONG YELLOW**
- CABINET POWER SUPPLIES**
- SERIAL BUS ERROR**



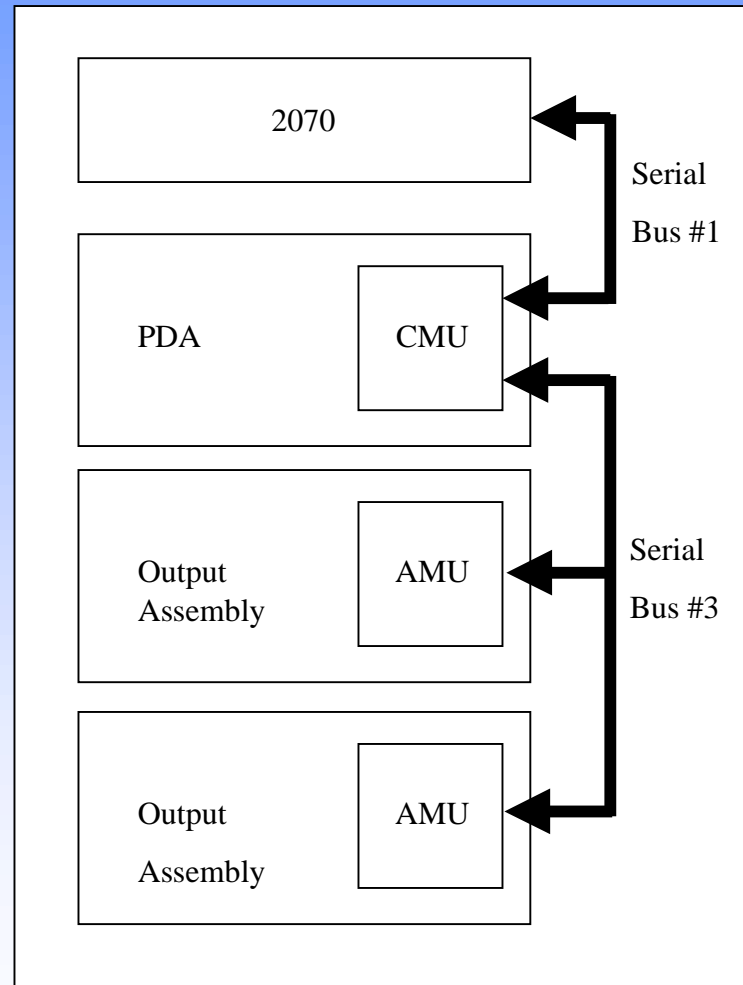
MONITOR FUNCTIONS (CONTINUED)

- **MONITOR ERROR**
- **FLASH TRANSFER RELAY FAILURE**
- **LOGIC SIGNAL ERROR**
- **FLASHER UNIT OUTPUTS**
- **CIRCUIT BREAKER / MERCURY CONTACTOR**
- **POLICE / PDS FLASH**
- **AC LINE**

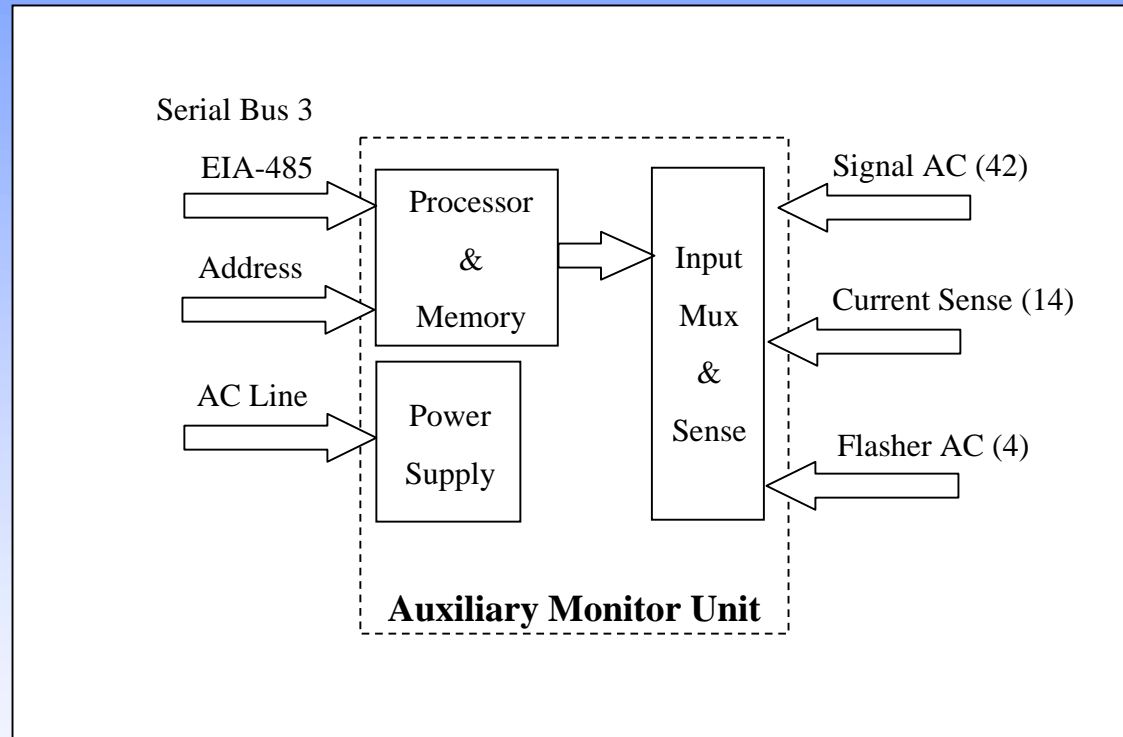
COMPONENTS

- **AUXILIARY MONITOR UNIT (MODEL 214 AMU)**
- **CABINET MONITOR UNIT (MODEL 212 CMU)**
- **SERIAL BUS #1 AND #3**
- **CONTROL / SERIAL BUS HARNESSES**
- **DC POWER / COMM ASSEMBLY**
- **CURRENT SENSE COILS**

MONITOR SYSTEM BLOCK DIAGRAM



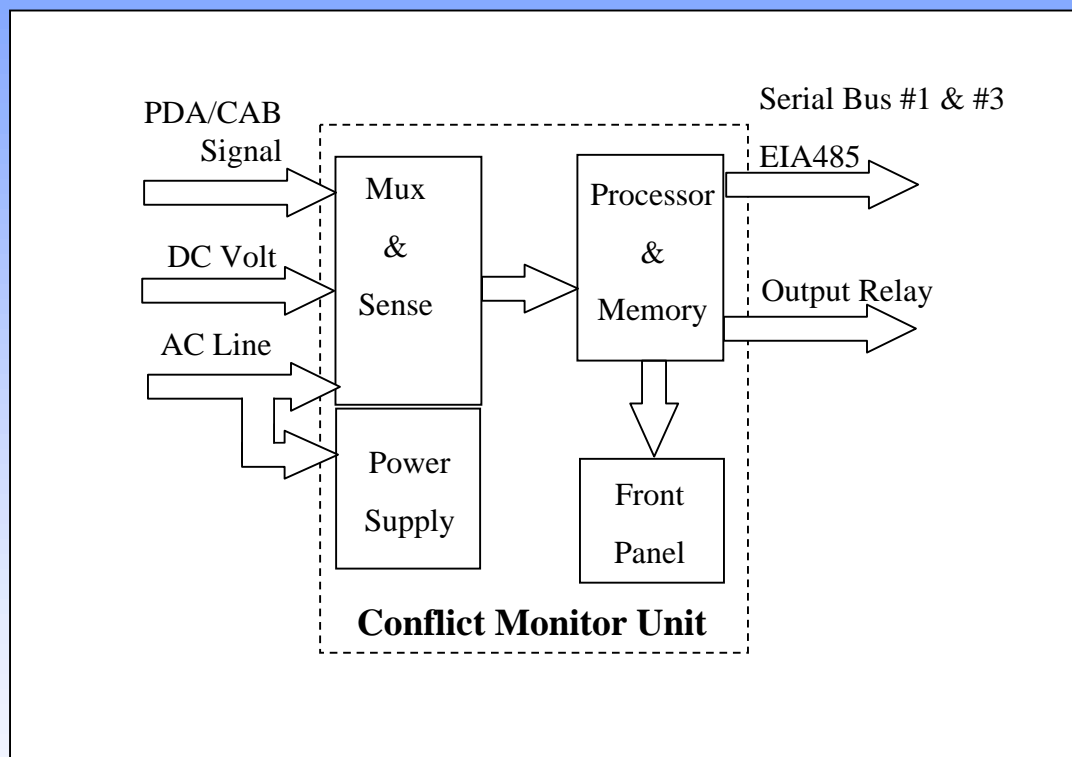
AMU BLOCK DIAGRAM



AMU FRONT PANEL FEATURES

- INDICATORS
 - DC POWER
 - COMM ACTIVE
 - ERROR
- RESET PUSHBUTTON
- HAND PULL

CMU BLOCK DIAGRAM



CMU FRONT PANEL FEATURES

- **POWER INDICATOR**
- **FAULT / STATUS INDICATORS**
- **DATAKEY**
- **RESET PUSHBUTTON**
- **EIA232 SERIAL PORT**
- **HAND PULL**

CMU FAULT / STATUS INDICATORS

- **24VDC**
- **12VDC**
- **CONFLICT**
- **LACK OF INDICATION**
- **MULTIPLE INDICATIONS**
- **CONTROLLER/LOCAL FLASH**
- **CLEARANCE**
- **FIELD CHECK**
- **SB#1 & SB#2 ERROR**
- **DIAGNOSTIC**

DATAKEY PROGRAMMING

- **CHANNEL ENABLES/ASSIGNMENTS**
- **CONFLICTING CHANNELS**
- **ENABLE MONITORING**
 - **LACK OF INDICATION**
 - **MULTIPLE INDICATION**
 - **SHORT/LONG YELLOW**

SESSION 3.6

ITS CABINET DAT VERSION 1.0 PROGRAM

**THIS PROGRAM IS A COMBINATION OF THE EAGLE
CABINET TEST PROGRAM AND CALTRANS DAT
PROGRAM DEVELOPMENT**

TARGETED COMPLETION NOVEMBER 2001

MINH V TRAN



2070 & ITS CABINET WORKSHOP - AUGUST 2001

ITS CABINET DAT TESTS

- **SERIAL BUS # 1 - COMMUNICATION COMMAND / RESPONSE BETWEEN 2070 CONTROLLER AND I/O ASSEMBLY WITH SIU (SERIAL INTERFACE UNIT) UNIT**
 - **TEST INDIVIDUAL SIU ADDRESS (CHANNEL 1 SIU)**
 - **TEST MULTI-ADDRESSING AS A SYSTEM**
 - **TEST LOOP OUTPUT / INPUT SIU**
 - **TEST SIU TO ASSEMBLY OUTPUT OR INPUT (FIELD CONNECTOR)**
 - **TEST CMU FUNCTIONS**
 - **TEST CMU / EMERGENCY SYSTEM FUNCTION**



ITS CABINET DAT TESTS CONT.

- **SERIAL BUS # 2 - COLLECTOR OF PREPROCESSED DATA FROM DETECTOR DEVICE BETWEEN 2070 CONTROLLER AND INPUT ASSEMBLY WITH SIU (SERIAL INTERFACE UNIT) UNIT**
 - **2070 COMM TO “SMART” DETECTOR ADDRESS VIA SIU (CHANNEL 2)**
 - **MULTI INPUT ASSEMBLY COMM DETECTOR ADDRESS UP TO 5 ASSEMBLER OR 60 DETECTOR SENSOR UNITS**
 - **CHECK TIMING AT 19.2 KBPS PER DETECTOR RESPONSE PACKET OF 10 DATA BYTES**

ITS CABINET DAT TESTS CONT.

- **SERIAL BUS # 3 - MONITOR SYSTEM**
 - AFTER SERIAL BUS #1 TEST OF CMU
 - TESTING CMU / AMU INDIVIDUAL ADDRESS
 - TEST CMU TO MULT AMU ADDRESSSS
 - TEST TIMING LOOPS
 - TEST AMU SENSING
 - TEST CMU PROCESSSSING

SESSION 3.7

CALTRANS ITS CABINET TESTING PROTOTYPE EVALUATION

JEFF FORESTER



2070 & ITS CABINET WORKSHOP - AUGUST 2001

ITS CABINET TESTING

- **PHYSICAL INSPECTION**
- **DIAGNOSTIC ACCEPTANCE TESTS**
- **POWER SUPPLY TESTS**
- **ENVIRONMENTAL TESTS**

PHYSICAL INSPECTION

- **ENSURE ALL DELIVERABLES ARE WITH CABINET**
- **PHYSICAL DIMENSIONS ARE CORRECT?**
- **MODULES, TERMINAL BLOCKS AND WIRING ARE PROPERLY LABELED? DO THEY MAKE SENSE?**
- **ENSURE INTERCHANGABILITY BETWEEN MANUFACTURERS**
- **EVALUATE DIFFERENT HOUSING COATINGS**

Graffiti Test

- Black permanent marker - allowed to stand for several days.
- Sprayed with Fantastic All Purpose cleaner.
- Wiped off with no residue.



Input File Test Card

- Tests for proper addressing
- Either 2-channels, or 4-channels
- Switches put call into respective channel



DIAGNOSTIC ACCEPTANCE TESTS

- **BASIC LOOP AROUND PROGRAM (2070)**
 - Tests SIU functionality and proper communications and addressing between inputs and outputs.
- **FULL DIAGNOSTICS**
 - Being developed by Traffic Operations

BASIC SIU TEST PROGRAM

- Sequences through all output phases, indicated by Light Box
- Enabled output is shown on 2070 front panel



POWER SUPPLY TESTS

- **POWER SUPPLY VOLTAGES AND LOAD TESTING**
 - Line and Load Regulation (90 - 135 VAC / 1 - 5 amps)
 - Efficiency
 - Ripple Noise
 - High and Low Temperature

ENVIRONMENTAL TESTS

- **LOAD AND RUN THE CALTRANS TRAFFIC CONTROL SIGNAL PROGRAM (2070)**
- **TEMPERATURE TESTING AT +74 C AND -37 C**
- **2 KVA TEST**

